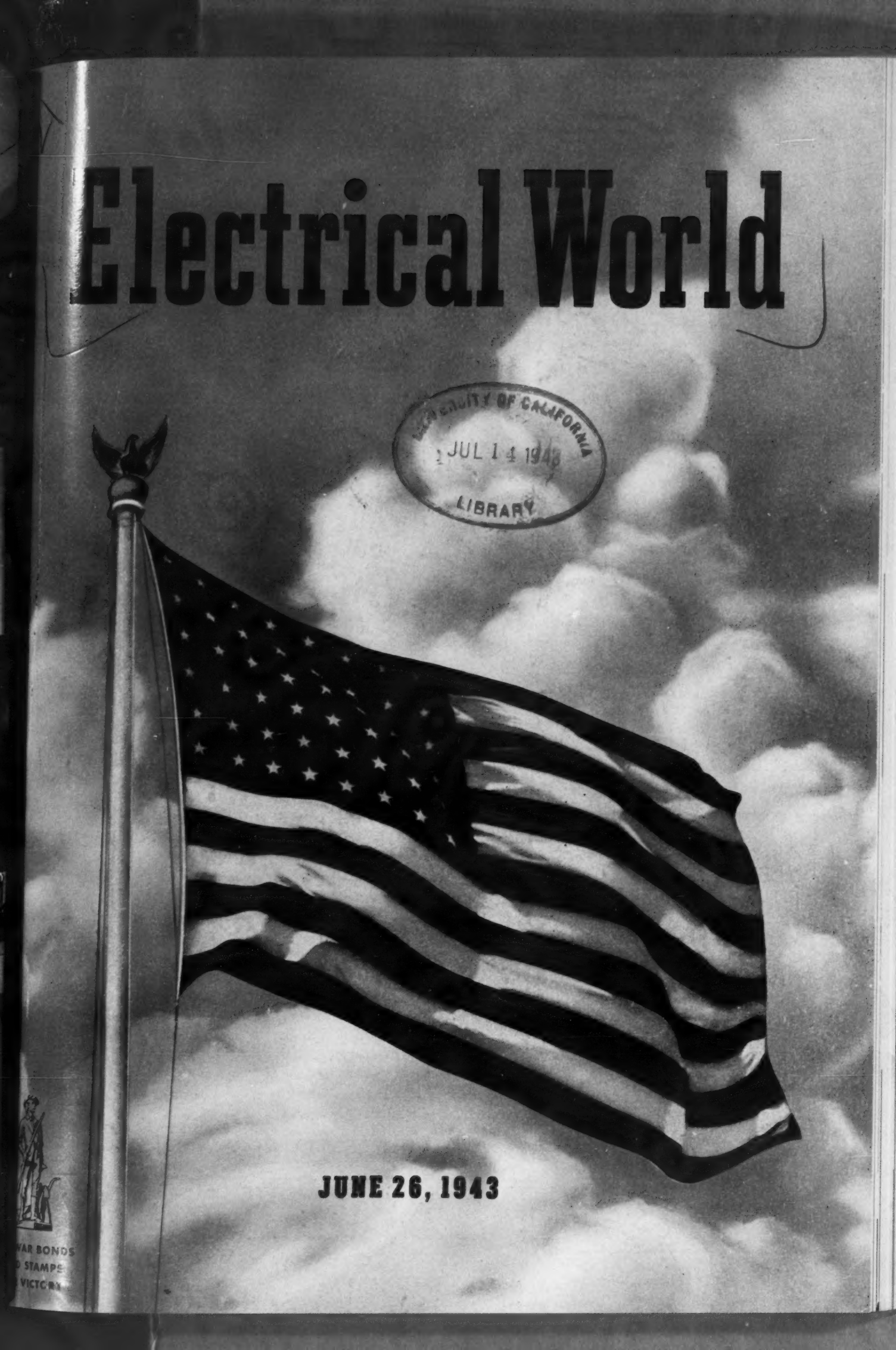
Electrical World



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WAR BONDS
STAMPS
VICTORY

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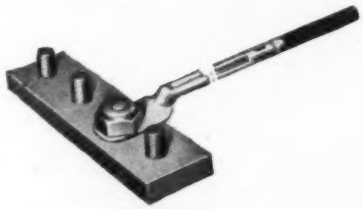
The Burndy LINKIT
(closed position)



The LINKIT Lug

The LINKIT with Burndy
VERSIFLEX insulating
sleeve

Headquarters for Connectors

Again, Burndy solves a small wire connection problem in a simple, foolproof manner.

The LINKIT is a detachable connector, positive in its action, and without any troublesome, extra parts . . . parts which might loosen or become lost.

It simply z-i-p-s into position, yet establishes a sound, secure contact over its entire fork contact area. To disconnect, a firm pull releases the contact grip, and it zips apart. Either operation wipes contact surfaces *clean.*

And the LINKIT provides a *sound* connection, mechanically as well as electrically. For it's forged from pure copper. *Pure copper for high conductivity . . . forging for high strength.*

Another advantage . . . the LINKIT is a modern solderless connector, attached in the same speedy and secure manner as popular Burndy HYLUG terminals . . . *simply indented to the wire with a Burndy HYTOOL.*

Samples of LINKIT, and other Burndy solderless connectors for small wires, will gladly be sent on request.

BURNDY ENGINEERING CO., INC., 107 Eastern Boulevard, N.Y.C.

BURNDY

Electrical World

FOUNDED IN 1874 • READ BY ELECTRICAL MEN FOR 69 YEARS

June 26, 1943 — Vol. 119, No. 26

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LECTRICAL WORLD

blished weekly. Price 25 cents a copy. Allow least ten days for change of address. Address communications about subscriptions to rector of Circulation, Electrical World, 330 est 42nd Street, 18, New York, N. Y.

RETURN POSTAGE GUARANTEED

bscription rates: In the United States, exico, Central and South American countries, $5 a year, $8 for two years, $10 for three ars, Canada $5.50 for one year, $9 for two ars, $11 for three years (Canadian money par). Great Britain and British possessions, shillings for one year, 108 shillings for ree years. All other countries $9 for one ar, $18 for three years. Entered as second-ass matter November 16, 1936, at Post Office Albany, N. Y., under the Act of March 3, 79. Printed in U. S. A. Contents copyrighted, 43, by McGraw-Hill Publishing Company, c. Branch Offices: 520 North Michigan venue, Chicago, Ill.; 68 Post St., San Francisco, 4; Aldwych House, Aldwych, London, C. 2; Washington, Philadelphia, Cleveland, troit, St. Louis, Boston, Los Angeles, Atlanta, a.

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ublication Office
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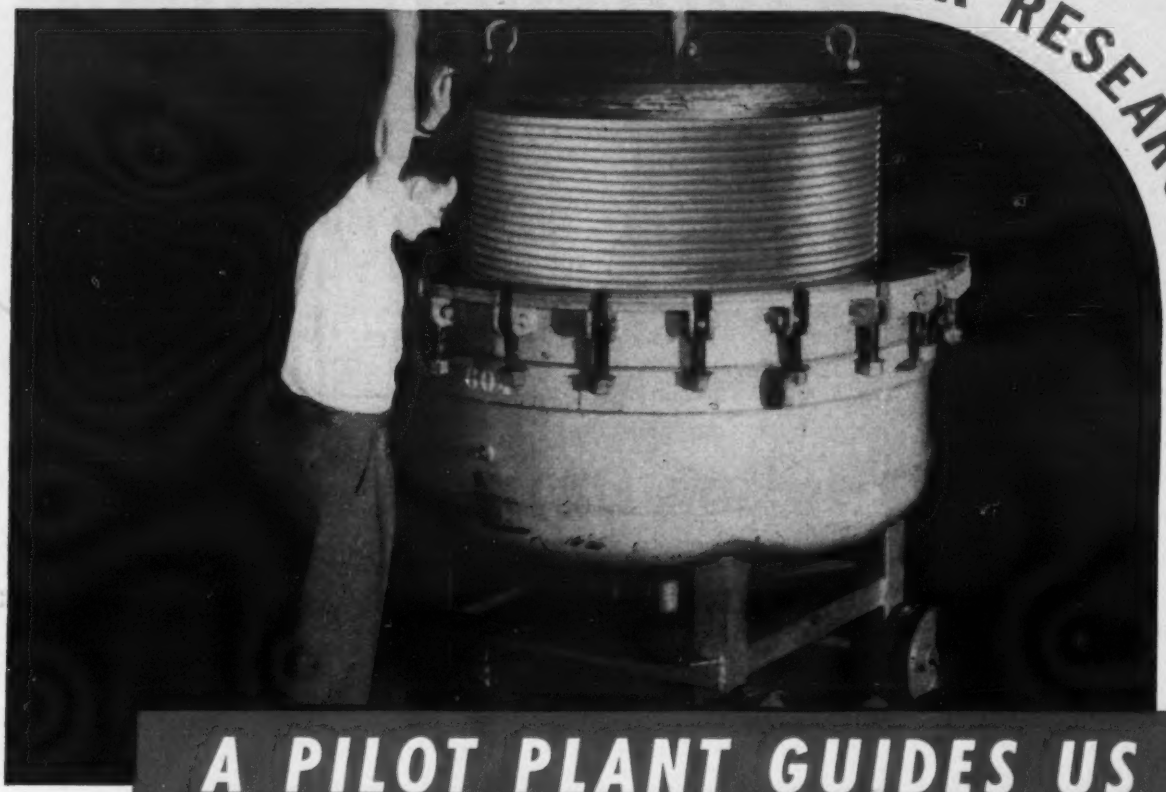
Signed .....

THROUGH OKONITE-CALLENDER RESEARCH



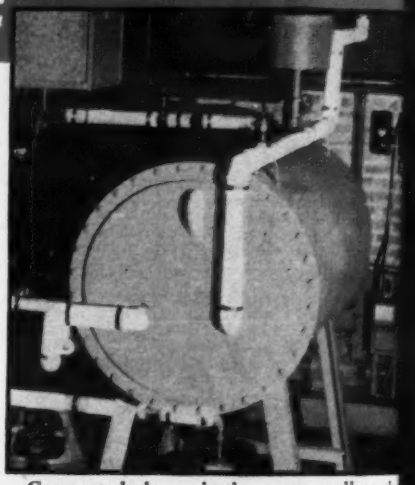
A PILOT PLANT GUIDES US ON THE PROPER COURSE

In Okonite-Callender's Research Laboratory there is a pilot plant. Here a complete manhole-length of experimental cable up to 2-inches in diameter, incorporating new materials or proposed design changes, can be dried and impregnated under the same precisely controlled conditions that can later be duplicated in actual factory production.

Only by making and testing a complete cable can service life expectancy be properly evaluated.

This pilot plant is another of the tools of Okonite-Callender research that, in the manufacture of oil-impregnated paper-insulated cables, make possible such improvements as: *metallized tapes* that retard insulation deterioration; *stabilized lead* that eliminates lead sheath defects; and *uniform thickness of lead sheath* made possible by the use of the "magic eye" electric concentricity gauge.

When you are considering paper-insulated cable, it will pay you to have our engineers explain the many Okonite-Callender research developments that contribute to longer cable life.



Connected through the oven wall to the drying and impregnating tank, this storage tank in the pilot plant is used for degassing, drying and heating the oil under vacuum before impregnating the new experimental cable.

THE OKONITE-CALLENDER CABLE CO., INC.

An Affiliate of The Okonite Company

Executive Offices: Passaic, N. J. • Offices in Principal Cities

OKONITE CALLENDER

PAPER INSULATED POWER CABLES

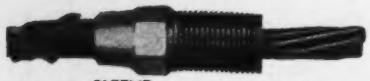
3319

Electroline FIEGE HEAVY-DUTY DEAD-END

FOR COPPER STRAND (300 to 1000 MCM)

SIMPLE TO INSTALL

ONLY THREE SIMPLE OPERATIONS TO COMPLETE THE DEAD-END CONNECTION



Strand passed through sleeve.

Wires broomed out for insertion of hollow plug.

Plug driven in and wires closed to apply socket.

Socket applied showing twisted wires and completed assembly

Gives You These SIX ADVANTAGES

1 **HIGH PRESSURE**—Metal to metal contact under high pressure gives ultimate electrical and mechanical strength.

2 **STRONGEST TYPE OF DEAD-END** when used with steel, copper, or composite strands.

3 **SOLDERLESS**—No hot metal is needed. No special tools required. Common tools make or unmake the connection.

4 **EASY INSPECTION**—Inspection holes make visual inspection of the joint quick and positive. No guess work. A sound connection is certain.

5 **NO WASTE** of conductor. The connector can be used over and over again. Easily disconnected. Free from corrosion.

6 **CONDUCTIVITY**—Its resistance is less than an equivalent length of the conductor.

Available in complete range of sizes from 300 MCM to 1000 MCM in Dead-End types as illustrated. Also made in Eye and Straight Coupling types. ***Write today for complete prices and illustrated literature.***

Electroline Company

Originators and Patentees of Automatic Line Splices and Dead Ends

4121 SOUTH LA SALLE STREET • CHICAGO, ILLINOIS

"THAT'S EXACTLY THE MOTOR I WANT"

..SAID THE CHIEF ENGINEER

It was a new pipeline pumping job, and the Chief Engineer of one of the big oil companies (name on request) knew just what he wanted in motors. He had seen some big Elliott high-speed, two-pole induction motors on a similar pipeline job, learned how well they were performing, had checked their advantages.

So now there's another Elliott 400-hp. two-pole squirrel-cage induction motor direct-connected to a pump, boosting oil through an important pipeline.

These motors need less than half the space formerly required for units of similar capacity. They are fully enclosed, base-ventilated. No firewall is needed between motor and pump. They are built for their job—and they fill it well.

This is just one of many applications in which these big high-speed Elliott motors are making engineers stop and think. Have you a job that needs them? Let's discuss it.

ELLIOTT COMPANY

Electric Power Department

RIDGWAY, PA.

DISTRICT OFFICES IN PRINCIPAL CITIES

L-745

The Army-Navy "E" has been awarded to both the Jeannette and the Ridgway plants of Elliott Company.

ELLIOTT is good on large high-speed . . . MOTORS

CHECK the FACTS

1. Hi-Pressure, self-cleaning, spot contacts make new, clean contact surfaces with each operation.
2. Hi-Pressure annular contact hinges keep constant contact in all blade positions—keep dirt and corrosion out of contact area, eliminating scoring.
3. Individual pressure springs insure uniform contact loading.
4. Positive blade latch prevents untimely opening of blade due to short circuit stresses.
5. Shuffle pryout releases pressure in opening.

DISCONNECTING SWITCH

The Check list

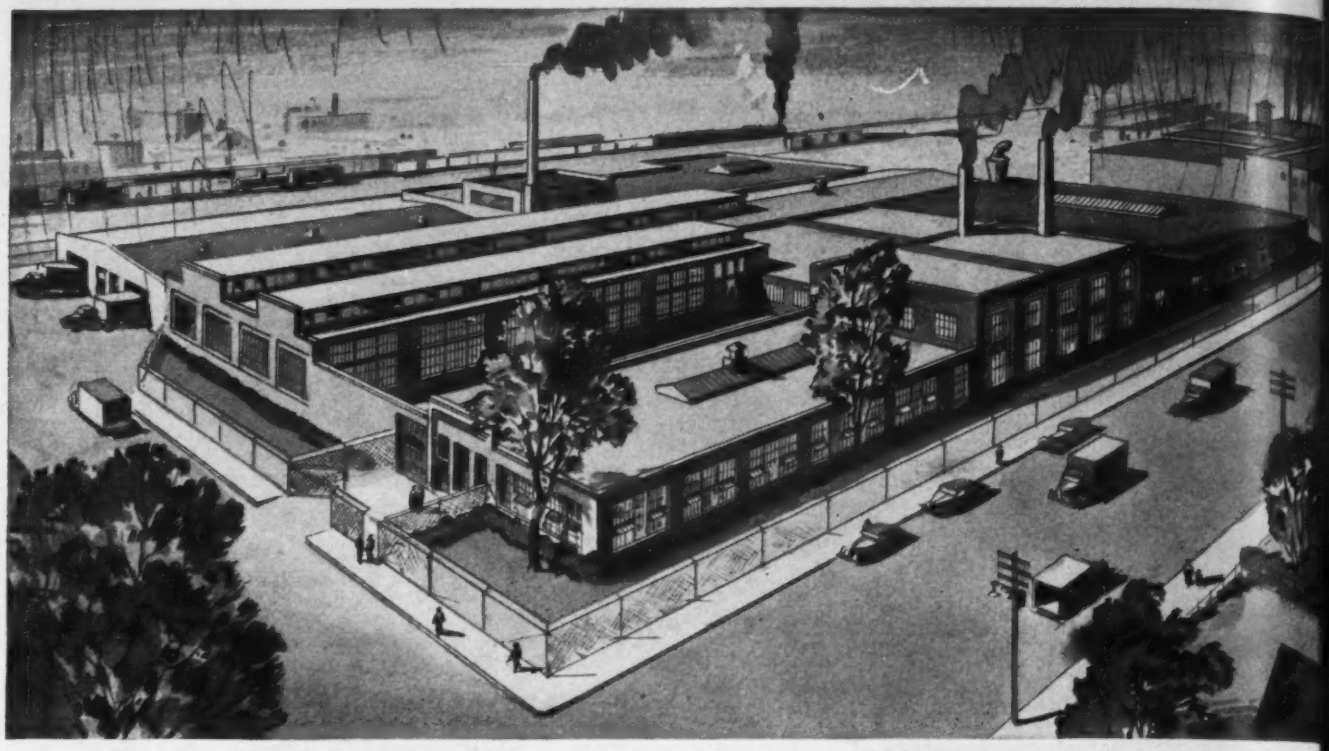
- CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS
- DISCONNECTING SWITCHES INDOOR AND OUTDOOR
- AIR BREAK SWITCHES
- INTERRUPTER SWITCHES
- CUTOUTS AND THERMO-RUPTERS
- SWITCH OPERATING MECHANISMS
- SUBSTATIONS
- OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES
- KIRK INTERLOCK SYSTEMS
- AUTOMATIC SECTIONALIZING EQUIPMENT
- METAL CUBICLES
- TESTING DEVICES

R&IE

RAILWAY AND INDUSTRIAL ENGINEERING CO., GREENSBURG, PA.

IN CANADA—EASTERN POWER DEVICES LIMITED TORONTO

PERMANENT MAGNETS MAY DO IT BETTE



THE LARGEST PLANT IN AMERICA

for Making Permanent Magnets!

IF YOU USE permanent magnets in your products, chances are that you've either dealt with us or heard about us sometime during the past 33 years. But if you haven't, we'd like to tell you how and why we can help you if there's a possibility of your using them in your *war or post-war* products.

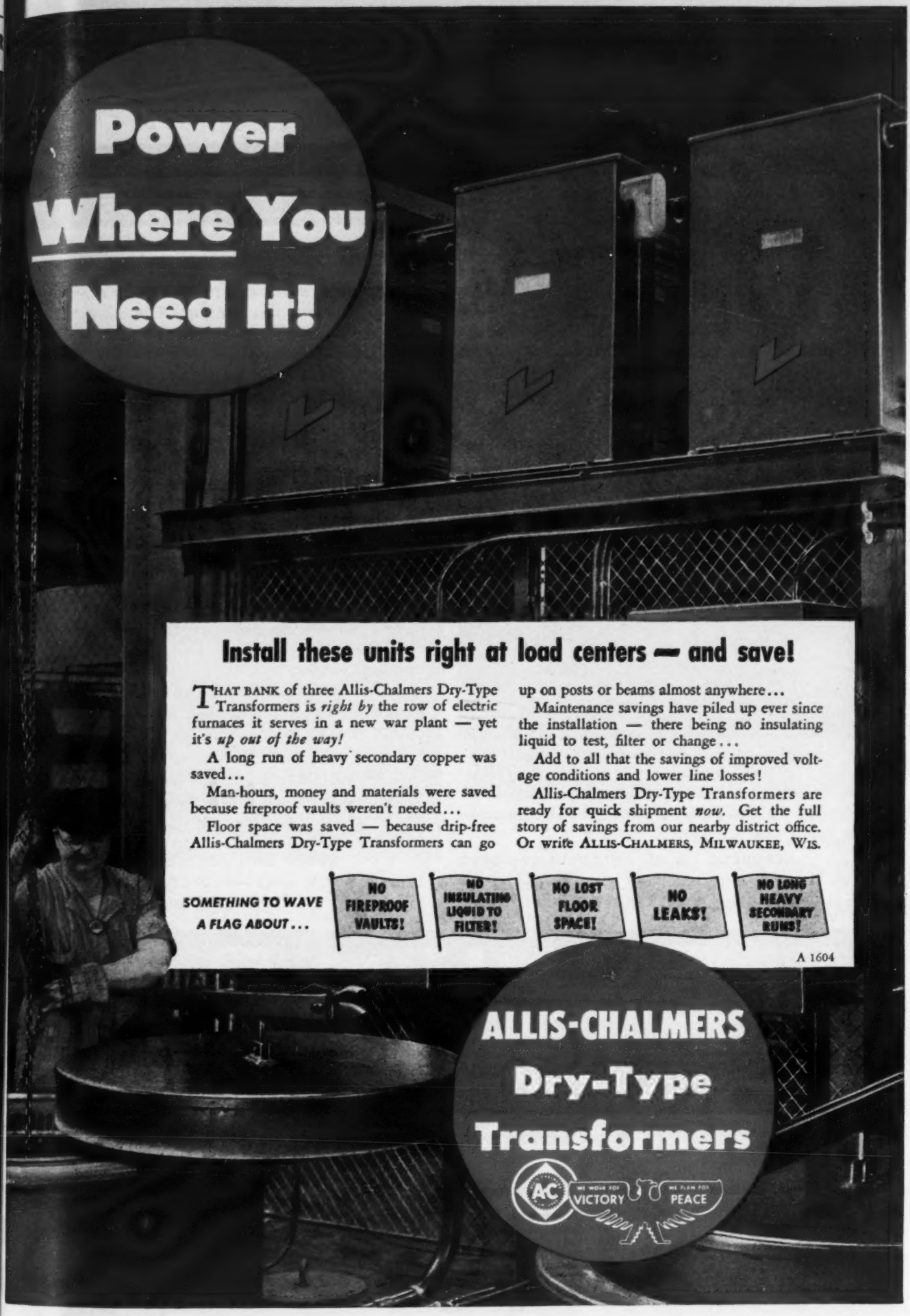
Since we started in business in 1910, we've specialized in doing *one* thing especially well—designing and producing *better* permanent magnets, and applying them intelligently to hundreds of different types of products. As a result, we have had a wealth of experience in all of the highly technical considerations involved—from the selection of the proper type and grade of materials to the quality of the finished magnets. Our plant is the nation's largest devoted to the exclusive production of permanent magnets. It is completely equipped and staffed with engineers and workers of the highest calibre.

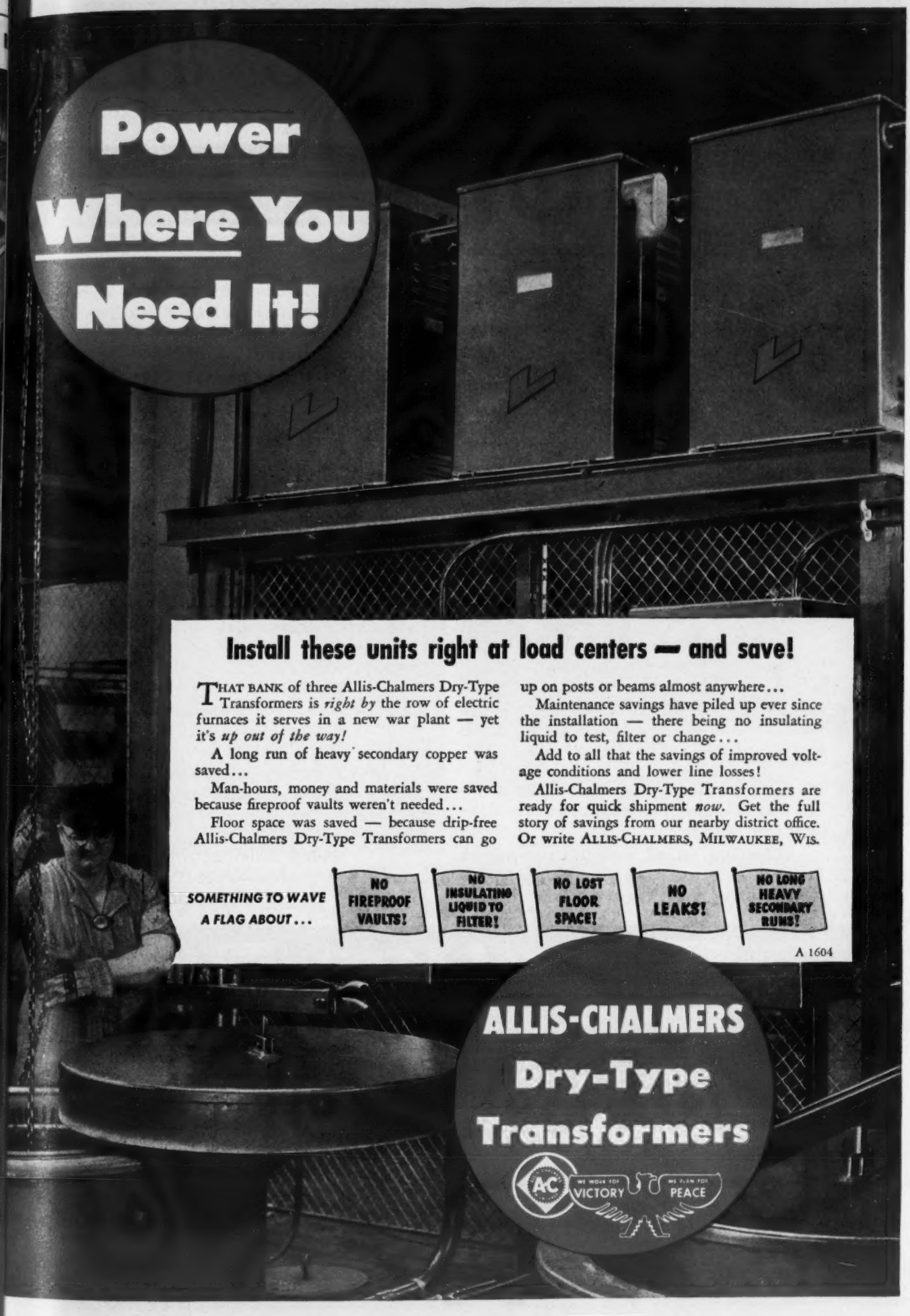
Our production capacity is now devoted entirely to war orders. But our engineers will be glad to show you how and why countless products function better with permanent magnets. Write for the address of our office nearest you and a copy of our 30-page "Permanent Magnet Manual."

The
INDIANA STEEL PRODUCTS
Company

★ SPECIALISTS IN PERMANENT MAGNETS SINCE 1910 ★

6 NORTH MICHIGAN AVENUE • CHICAGO, ILLINOIS


Power Where You Need It!
Install these units right at load centers — and save!
THAT BANK of three Allis-Chalmers Dry-Type Transformers is *right by* the row of electric furnaces it serves in a new war plant — yet it's *up out of the way!*
A long run of heavy secondary copper was saved...
Man-hours, money and materials were saved because fireproof vaults weren't needed...
Floor space was saved — because drip-free Allis-Chalmers Dry-Type Transformers can go up on posts or beams almost anywhere...
Maintenance savings have piled up ever since the installation — there being no insulating liquid to test, filter or change...
Add to all that the savings of improved voltage conditions and lower line losses!
Allis-Chalmers Dry-Type Transformers are ready for quick shipment *now.* Get the full story of savings from our nearby district office. Or write ALLIS-CHALMERS, MILWAUKEE, WIS.
SOMETHING TO WAVE A FLAG ABOUT...
NO FIREPROOF VAULTS!
NO INSULATING LIQUID TO FILTER!
NO LOST FLOOR SPACE!
NO LEAKS!
NO LONG HEAVY SECONDARY RUNS!
A 1604
ALLIS-CHALMERS
Dry-Type
Transformers
AC
WE WORK FOR VICTORY
WE PLAN FOR PEACE



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SOMETHING TO WAVE A FLAG ABOUT...

NO FIREPROOF VAULTS! | NO INSULATING LIQUID TO FILTER! | NO LOST FLOOR SPACE! | NO LEAKS! | NO LONG HEAVY SECONDARY RUNS!

A 1604

ALLIS-CHALMERS
Dry-Type Transformers

AC WE WORK FOR VICTORY WE PLAN FOR PEACE

War isn't all

OUT OF WAR'S RUTHLESS DEMAND FOR HIGHER AND HIGHER EF

EQUIPMENT. HERE ARE A FEW FROM ALLIS-CHALMERS . . . NE

☛ World's biggest "wringers" give the first squeezes to arc furnace ingots on their way to flawless plate for modern welded-together invasion equipment. Back and forth, a 7000 hp reversing motor passes the ingot through the blooming mill rolls—one reversal every 1¼ seconds!

Formerly, it took 40% more time to reverse big blooming mill motors than it does today with Allis-Chalmers "Regulex" exciter, wide-range, acceleration-and-deceleration control.

REGULEX EXCITER SET FOR ARC FURNACE CONTROL

Stepping up of production-speed of mills and furnaces—without building them bigger—is what "Regulex" control is doing for the war. More and more steel mill men are now demanding "Regulex"—star performer in Allis-Chalmers line of electric power control.

Postwar possibilities of the "Regulex" exciter are tremendous!

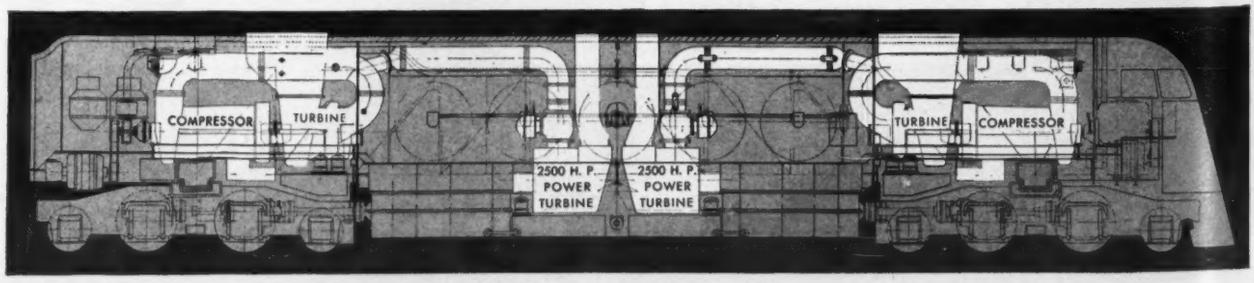
☛ Because of minimum operating costs, small size and weight per unit of power, absence of water—gas turbine power units have already been installed on the drawing board in a 5000 hp, 120 mile per hour locomotive. See below.

Here two 2500 hp units equalize weight on front and rear drivers. Each has two gas turbines, one to keep proper speed on compressor, the other to drive the wheels through a hydro-mechanical transmission.

Moral: The gas turbine—power plant of the future—is economical and compact enough to fit on wheels!

☛ Electronic power—lightning in leash—flows in tanks of mercury arc rectifiers to convert alternating current to direct current.

Every 360th of a second—218 million times a week—rectifiers must "fire" precisely at the right moment. In Allis-



PROPOSED 5000 HORSEPOWER GAS TURBINE DRIVEN LOCOMOTIVE

A-C WE WORK FOR VICTORY WE PLAN FOR PEACE

ALLIS

destruction..

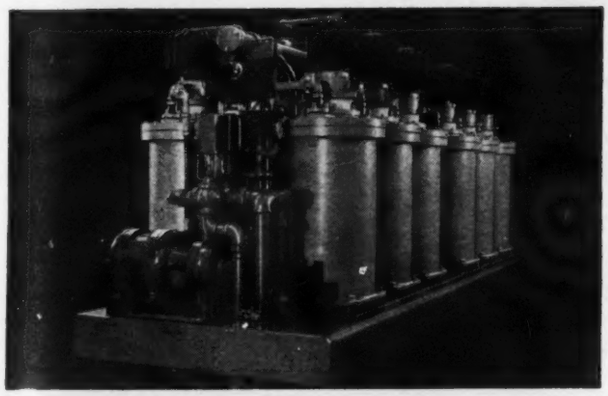
EFFICIENCIES COME NEW IDEAS IN POWER AND ELECTRICAL

NEW GRIST FOR THE MILLS OF POST-WAR PLANNERS. . . .

Chalmers "Excitron" rectifiers a pilot arc of only 1/150th of the main arc keeps the main arc "primed," without contributing to arc-backs. This continuous pilot excitation system is what makes "Excitrons" stable . . . keeps them "firing" for war production!

Biggest wartime use for electronically rectified d-c is in the electrolytic reduction of aluminum and magnesium for planes; production of chlorine gas.

Tomorrow? "Excitrons" are now being groomed by Allis-Chalmers engineers for uses other than a-c/d-c conversion, looking to an age of electronic power!

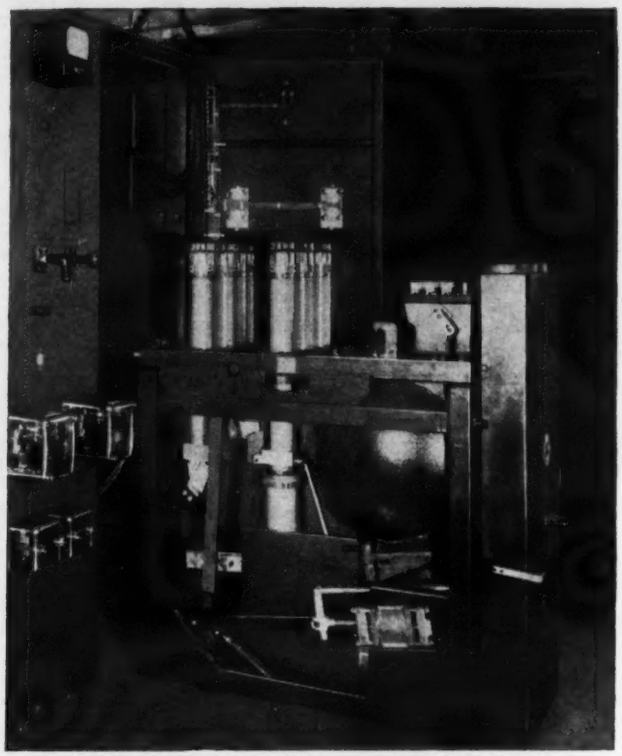


12-TANK "EXCITRON" RECTIFIER

☛ War's demand for higher efficiencies is giving new prominence to Allis-Chalmers air blast circuit breakers.

Reason: Arcing time of air blast breaker is always less than 1/2 cycle . . . that is, at the next current-zero of the 60-cycle wave after contacts part, arc "is out", to stay. Contact life is amazing . . . protection is complete.

Air blast principle: 1) prestored high pressure dry air released to breaker manifold forces piston contact back from



AIR BLAST BREAKER IN METAL-ENCLOSED SWITCHGEAR

orifice, 2) arc is drawn and vanishes with the turbulent air through the hole, 3) Arc products, too, have vanished . . . precluding reignition of arc. All this happens in less than 1/120 of a second.

Note on reliability: steel mills, where reliability is perhaps at its highest premium, are becoming more and more interested in air blast breakers.

Look for other important new developments in electrical and power equipment from Allis-Chalmers. Maybe we can help you—maybe you can help us. ALLIS-CHALMERS, MILWAUKEE, WIS. A 1632

S-CHALMERS

STATION AUXILIARIES PROTECTION— *At Lower Cost!*

● The designing engineers of this plant decided on *fuse* protection for feeders to boiler feed pumps, coal handling equipment and other motor-driven station auxiliaries,—S & C protection with Type "SM" Fuses for the eight, three-phase 2300 volt circuits.

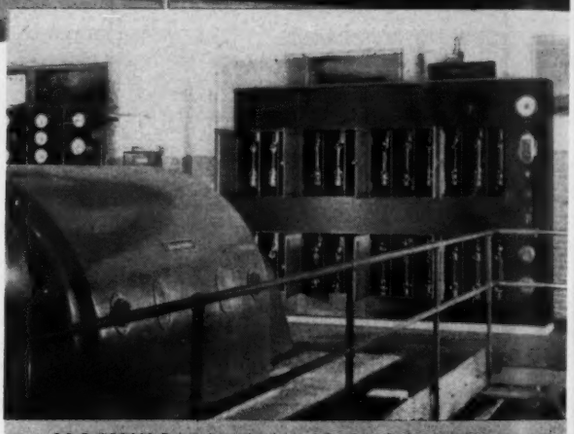
Use of S & C Type "SM" Fuses provided a compact, space-saving installation—low in initial cost and maintenance. No load switching is required, the motors being controlled at their respective locations.

These Fuses are rated from 1 to 400 amperes, with short circuit interrupting ratings up to 1,000,000 KVA. They are made for indoor or outdoor service for use on 2300/4000, 6600, 13,200, 22,000 and 33,000 volt circuits.

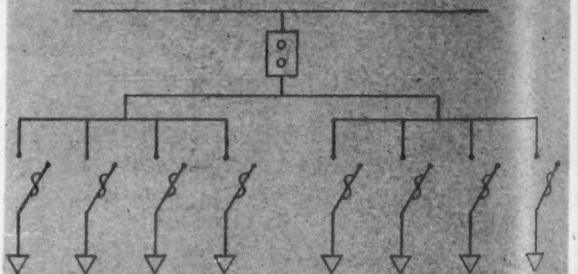
S & C engineers will be glad to assist in the selection of proper protection on your projected work.

SCHWEITZER & CONRAD, INC.
4435 Ravenswood Ave., Chicago, Illinois
Manufactured in Canada by Powerlite Devices, Ltd., Toronto, Ont.

TYPE "SM"
HIGH INTERRUPTING CAPACITY
FUSES



S&C 7500V Fuses in cubicle protecting 8 three-phase 2300V circuits for station auxiliaries. Doors open to show Fuses—Cubicle built by G and N Engineering Co.



Station Auxiliary Equipment bus,—2300 Volt three-phase circuits to Station Auxiliary Drives

SHORT CIRCUIT-INTERRUPTING RATINGS IN R.M.S. AMPERES

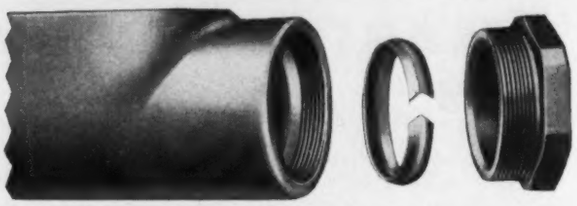
Fuse Voltage Rating →	7,500	7,500	15,000	23,000	34,500
Circuit Voltage →	2,300/4,000	6,600	13,200	22,000	33,000
**SMPC-4	17,500	15,000	12,500	10,000	7,500
SMP-4	27,500	25,000	20,000	15,000	10,000
**SMPC-5	30,000	25,000	20,000	17,500	15,000
SMP-5	40,000	35,000	30,000	25,000	20,000

**Equipped with Condenser

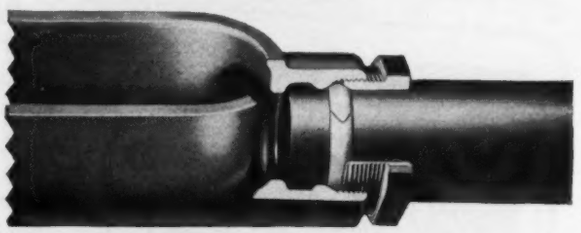
NEW CONDULETS for Electrical Metallic Tubing

(Thin Wall Conduit)

Assembly of Condulet and Electrical Metallic Tubing

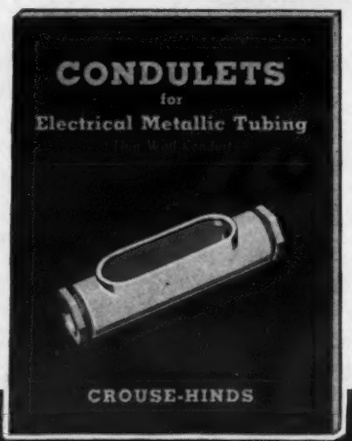


Exploded View of Condulet Showing "Fish-tail" Grip-Ring and Clamping Nut



Sectional View Showing Action of Nut and Grip-Ring on Electrical Metallic Tubing

- **A Complete Line**—Condulets to provide outlets for light, power, switching, junction boxes, etc.
- **Ease of Installation**—Simply insert the tubing and tighten the clamping nut, which has a broad hexagonal head easy to grip with any wrench.
- **Rigid Joint**—The compressed grip-ring bites into the tubing, providing a strong rigid joint.
- **Continuity of Ground**—Intimate contact provides a dependable raceway ground.
- **Internal Threads**—Safe from bruising in handling or installing.
- **Alignment**—Perfect alignment with existing rigid conduit installations.
- **Tubing Fit**—The accurately machined clamping nut assures a close fit with the tubing.
- **Sizes**—For electrical metallic tubing from ½-inch to 2-inch.



Send for Bulletin No. 2570 which contains complete listings of Condulets for electrical metallic tubing.

A Nationwide Distribution Through Electrical Wholesalers

MANUFACTURED ONLY BY

CROUSE-HINDS COMPANY

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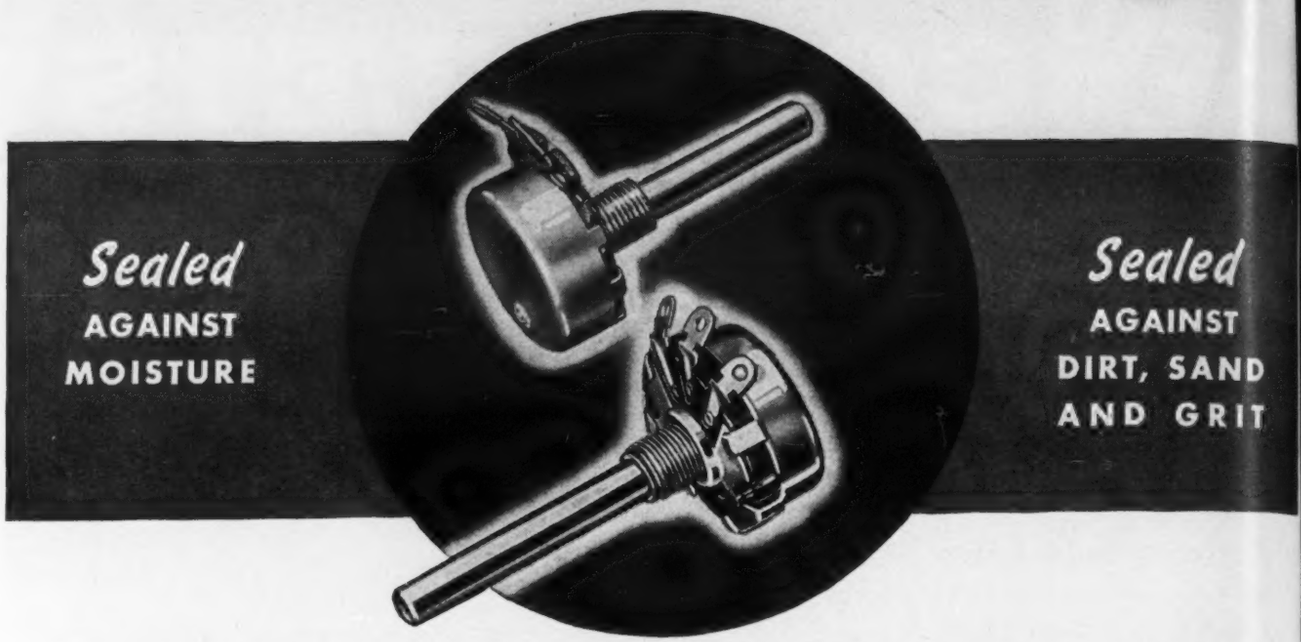
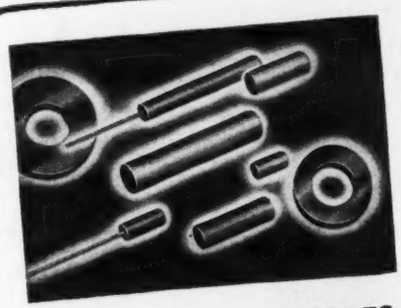
Offices: Birmingham · Boston · Chicago · Cincinnati · Cleveland · Dallas · Denver · Detroit · Houston · Indianapolis · Kansas City · Los Angeles · Milwaukee · Minneapolis · New York · Philadelphia · Pittsburgh · San Francisco · Seattle · St. Louis · Washington

Resident Product Engineers: Albany · Atlanta · Charlotte · New Orleans

CROUSE-HINDS COMPANY OF CANADA, LTD., *Main Office and Plant:* TORONTO, ONT.



MAKING EQUIPMENT THAT CALLS FOR *Sealed* VARIABLE RESISTORS?



STACKPOLE IRON CORES

Thanks to years of specialized experience in the molding of solids from metal powders, Stackpole has the answer to almost any iron core problem. Among the many types produced regularly are iron cores for use at frequencies as high as 150 to 175 megacycles. Other cores for fixed or variable inductance, or for station tuning are available in many grades and sizes for use at any frequency up to 50 megacycles.

Need Variable Resistors that will stand the gaff of operation under wet, humid, sandy, or dusty conditions?

Then it should pay to check your requirements against the Stackpole Types MG and LP units that were specifically developed for just such jobs.

Type MG Variable Resistor is designed for extremely humid or salt spray conditions, and for use where internal and external leakage must be held to a minimum. *Actually, leakage is on the order of 300 meg. after 48 hours in 95% humidity at 40° C.*

Type LP Variable Resistor, long known for its dependability, is now furnished with a dust-proof cover and effectively sealed with a special compound to the point where resistivity from current carrying parts after 48 hours of 95% relative humidity at 40° C. *is five times that of the previous open-construction units!*

Complete details gladly sent upon request.

STACKPOLE CARBON COMPANY, ST. MARYS, PENNA.

STACKPOLE MOLDED PRODUCTS

Carbon, Graphite, Metal and Composition Contacts • Brushes for all rotating equipment • Carbon Anodes • Bearings • Brazing Blocks • Electrodes • Pipe • Rheostat Plates and Discs • Welding Rods, Electrodes and Plates, etc., etc.

STACKPOLE ELECTRONIC COMPONENTS

Fixed and Variable Resistors • Iron Cores • Switches

STACKPOLE

EVERYTHING IN CARBON BUT DIAMONDS

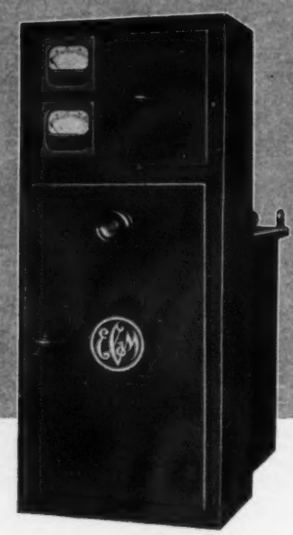
A complete line of 110-550 Volt

Synchronous Starters

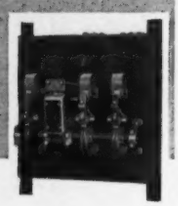
for general industrial service and for special applications, such as pipe-line duty, etc.

OIL-IMMERSED, DEAD FRONT TYPE with auto-transformer starter or full-voltage magnetic contactor in rear tank and automatic field-switching panel in front compartment. Available, when needed, with oil-immersed field-panel for Class 1, Group D Hazardous Locations.

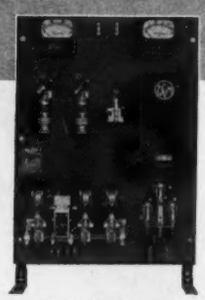
AIR-BREAK, OPEN OR ENCLOSED TYPE with EC&M *LINE-ARC* Magnetic Contactors for main line and motor circuits. Reduced-voltage starters have auto-transformers mounted, with field-discharge resistors, on rear of panel (open type) or in bottom of cabinet (enclosed type).



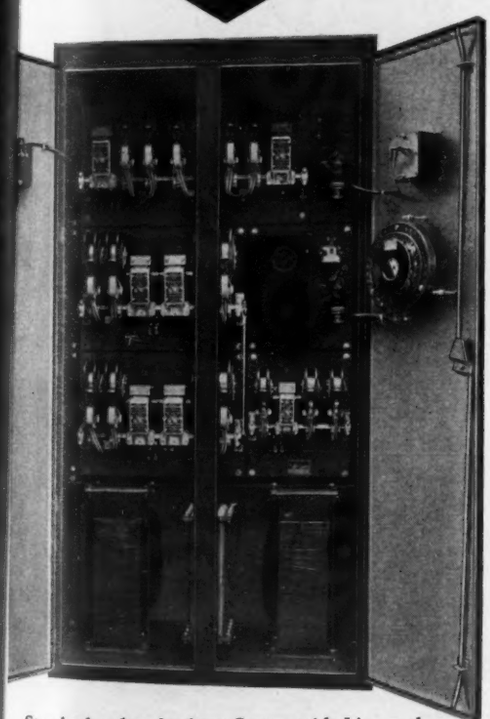
Automatic Compensator for reduced-voltage starting.



Magnetic Contactor for full-voltage starting.



Full Voltage (open type) Starter



Standard reduced-voltage Starter with Line and Field Ammeters and Handle of Exciter Field Rheostat accessible from front when doors are closed.

BULLETIN 1075-A

EC&M Oil-immersed Starters have these features:

- Completely enclosed, compact unit for mounting alongside the motor or in a control room.
- Two or three phase service. Maximum ratings (reduced voltage) 150 HP, 220 volts and 300 HP, 440 and 550 volts—(full voltage) 400 HP, 220 volts and 800 HP, 440 and 550 volts.
- With self-contained "Start-Stop-Reset" switch or separately mounted Push Button.

BULLETIN 1076-A

EC&M Air-Break Starters have these features:

- Open style for Control Room mounting or with Enclosure suited to operating conditions.
- Two or three phase service for motors up to 400 HP, 220 volts or 800 HP, 440 and 550 volts.
- With Push Button self-contained or for separate mounting to provide remote control.

Both types of Starters have these standard features:

- Automatic field application by quickly-adjustable, NEO-TIME (electronic type) Relay.
- Non-creeping, adjustable, magnetic Overload Relays.
- Field removal and automatic resynchronization (optional).

EC&M COMPLETELY AUTOMATIC– – SYNCHRONOUS STARTERS

THE ELECTRIC CONTROLLER & MFG. CO., Cleveland, Ohio

Proud as a peacock, bustin' with pride and satisfaction—a new DAD!

We like to think you have a good feeling of satisfaction, too, over your domestic heating load. The durability of the Chromel elements, now so hard to get as replacements, keeps the heating devices still plugged into your lines, as good and steady revenue producers. For technical data on Chromel ask for Catalog M-W.

HOSKINS MANUFACTURING COMPANY, DETROIT, MICHIGAN

Chromel
NICKEL CHROMIUM
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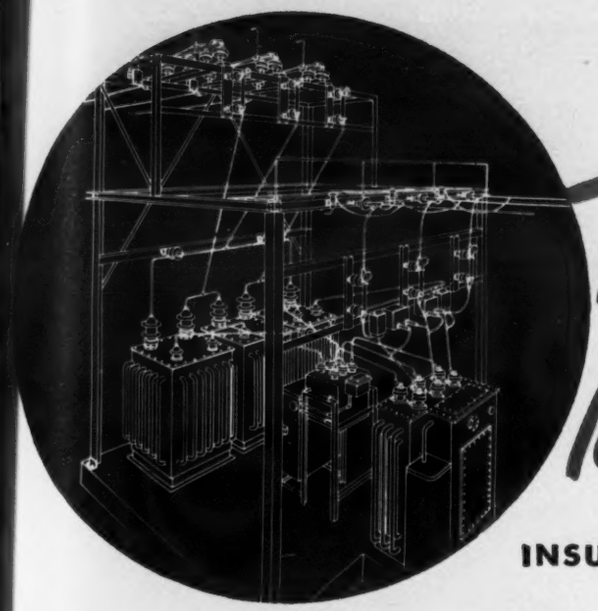
CHROMEL
ELECTRICAL HEATING ELEMENT
WIRE



To reduce outages.. localize breakdowns

SPECIFY WESTINGHOUSE APPARATUS

INSULATORS FOR THE ENTIRE SUBSTATION

FROM 7½KV TO 287KV WESTINGHOUSE APPARATUS INSULATORS MEET EEI AND NEMA BASIC INSULATION LEVEL STANDARDS

Today's substation installations have an important job to do. There's no time for service outages because of unexpected insulator failure.

That's why we say, "Specify Westinghouse B.I.L. Standard Apparatus Insulators."

- The line is *complete,* ranging all the way from 7½ kv to 287 kv capacity.
- Each insulator conforms to EEI and NEMA "Basic Insulation Level" standards.
- Each insulator can be depended upon to provide a predetermined basic insulation level.

With these advantages, you can co-ordinate your entire substation at the correct insulation level. You can design your system to reduce outages, and—if electrical breakdown from lightning occurs—localize it at a point where the least damage will result to apparatus and service.

Next time you order outdoor apparatus insulators, specify Westinghouse porcelain. Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa. Factories at Derry, Pa., and Emeryville, Calif. J-05137

69 kv Insulator

Withstand Impulse Voltage: 350 kv with 1½ x 40 microsecond positive wave.
Dry Voltage: 175 kv, 60 cycle, 1 minute withstand.
Wet Voltage: 145 kv, 60 cycle, 10 second withstand.
Radio Noise Influence Voltage: 200 microvolts at 44 kv test voltage to ground.

46 kv Insulator

Withstand Impulse Voltage: 250 kv with 1½ x 40 microsecond positive wave.
Dry Voltage: 120 kv, 60 cycle, 1 minute withstand.
Wet Voltage: 100 kv, 60 cycle, 10 second withstand.
Radio Noise Influence Voltage: 200 microvolts at 30 kv test voltage to ground.

PLUS R.I.P. at no extra cost

R.I.P. stands for Radio-Interference-Proof—the simple permanent answer to all problems of insulator-generated radio noise. All Westinghouse Outdoor Switch and Bus Insulators, including the new units, are Radio-Interference-Proof.

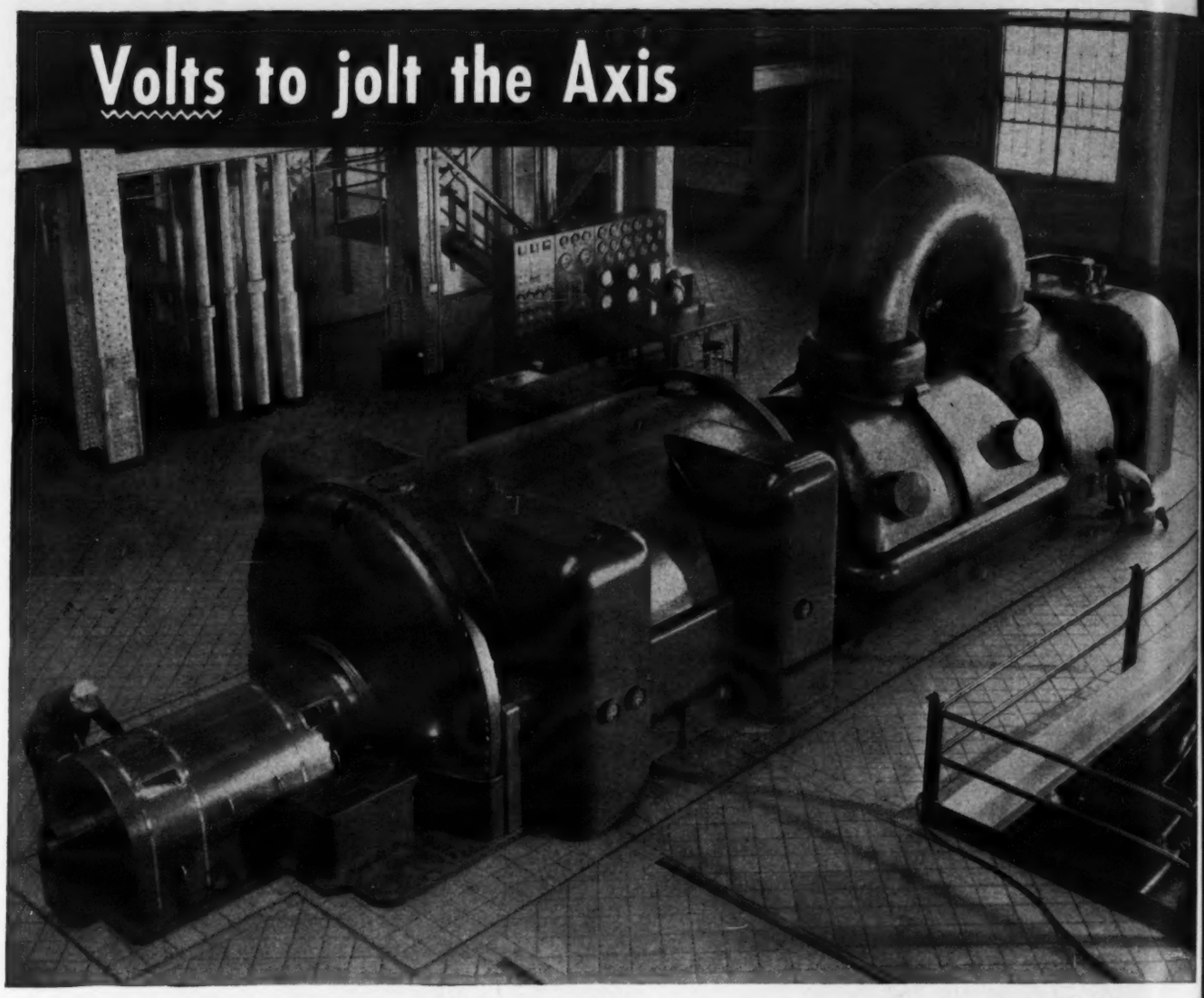
7½ kv Insulator

Withstand Impulse Voltage: 95 kv with 1½ x 40 microsecond positive wave.
Dry Voltage: 38 kv, 60 cycle, 1 minute withstand.
Wet Voltage: 30 kv, 60 cycle, 10 second withstand.
Radio Noise Influence Voltage: 30 microvolts at 5 kv test voltage to ground.

Westinghouse PORCELAIN

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

Volts to jolt the Axis

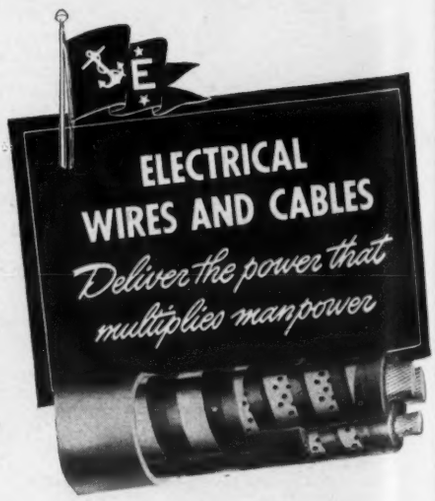


ONE of the reasons America's war production has grown in two years to proportions that Hitler couldn't achieve in ten, is our vast, unfailing output of electric power.

Throughout the nation, great power stations hum at full capacity day and night, producing the electric energy that keeps our mines, mills, factories and shipyards going . . . and on top of that, the power and light to keep our civilian life going, too.

Only electrical wires and cables of the utmost dependability can be trusted to transmit this vital energy. That is why we are proud of the important part played by American Steel & Wire Company products.

Our years of research are demonstrating their value now. And, looking toward the day when peace comes, our engineers continue their unceasing efforts to improve the quality of these products.



AMERICAN STEEL & WIRE COMPANY

Cleveland, Chicago and New York

Columbia Steel Company, San Francisco, *Pacific Coast Distributors* — United States Steel Export Company, New York

UNITED STATES STEEL

Synonymous with Quality!

Wagner

TRANSFORMERS

reflect sound engineering and modern manufacturing methods . . .

★ ★ ★

POWER
DISTRIBUTION
AIR-COOLED
NOFLAMOL*
***(NON-INFLAMMABLE LIQUID FILLED)**

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

WAGNER BRANCH OFFICES

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PITTSBURGH
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SALT LAKE CITY
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SEATTLE
SYRACUSE
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WASHINGTON, D.C.

In army camps, ordnance and power plants, in the oil fields, and throughout the chemical and steel industries, Wagner transformers daily demonstrate their excellence in quality. From the very beginning, the name Wagner has been *synonymous with quality.*

If you are in need of transformers to complete your war production schedules, consult the nearest of Wagner's 29 branch offices, located in principal cities and manned by trained field engineers.

143-4

Write

FOR BULLETINS
TU-33 (NOFLAMOL)
TU-181 (POWER)
TU-180 (DISTRIBUTION)

★ ★ ★

Wagner Electric Corporation

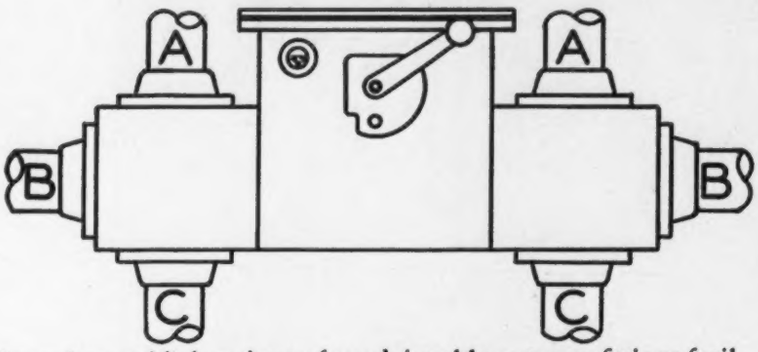
ESTABLISHED 1891

6456 Plymouth Avenue, St. Louis, Mo., U. S. A.

ELECTRICAL AND AUTOMOTIVE PRODUCTS

Conduit Connections

can be made from three directions on either side of new oil switch



Interchangeable locations of conduit-cable entrance fittings facilitate installation of the switch under variable conditions.

A—Vertically from above.
B—Horizontally.
C—Vertically from below.

Cables are terminated in compartments having three openings on which the conduit—cable entrance fittings can be interchangeably located. By using an extra entrance fitting two circuits (straight through run) can be terminated in one compartment.

G & W Type "DIPK" SINGLE THROW OIL SWITCH

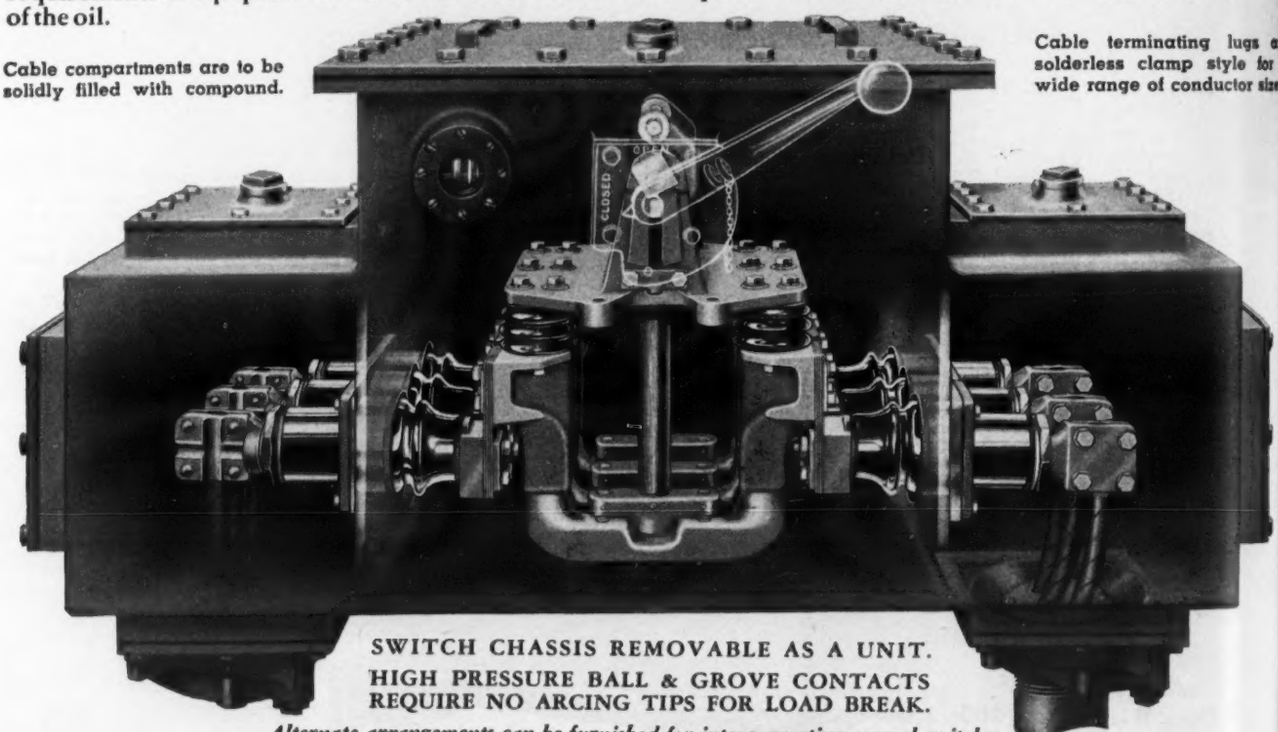
3 pole—5000 volts—600 amps.

FOR CLASS 1, GROUP D, HAZARDOUS LOCATIONS

G & W Type "DIPK" oil switches were specially designed for use in oil refineries and chemical plants to meet the requirements of equipment for hazardous locations. The live parts within the oil switch are 6 inches below the level of the oil.

Cable compartments are to be solidly filled with compound.

Cable terminating lugs are solderless clamp style for a wide range of conductor sizes.



SWITCH CHASSIS REMOVABLE AS A UNIT.
HIGH PRESSURE BALL & GROVE CONTACTS REQUIRE NO ARCING TIPS FOR LOAD BREAK.

Alternate arrangements can be furnished for interconnecting several switches by converting cable compartment to a section of a compound filled bus run.

Send for Bulletin No. 543

G&W ELECTRIC SPECIALTY CO.

7780 Dante Avenue **Chicago, Illinois, U.S.A.**

Also made in Canada by Powerlite Devices, Ltd., Toronto

G&W ELECTRIC CABLE DEVICES

POTHEADS . . . BOXES . . . OIL FUSE CUTOUTS . . . OIL SWITCHES AND MULTIPLE CIRCUIT OIL DISCONNECTS

IT'S THE PORCELAIN THAT INSULATES

POTTERS' WHEEL: 1943. In the Lapp factory, a centuries-old technique in clay handling becomes a fundamental process in production of the world's most up-to-the-minute insulator. It may fairly be said that the Line Post owes its existence to the fact that Lapp clay can be handled by this throwing process. Here air-free clay is worked and reworked, refined and formed, preparatory to the Lapp dry-turning process. To know more about porcelain—and so to produce better porcelain—is the basis on which Lapp claims to produce insulators which will perform better on your lines. May we describe to you the many reasons behind this claim?

Lapp Insulator Co., LeRoy, N. Y.

ARMY E NAVY

Lapp

Better Porcelain • Better Insulators

Empire VARNISHED CLOTH AND TAPE helps lick 3 wartime insulating problems!

Conserves rubber in cable insulation

If you are putting cables into rooms that are hot . . . if cables must withstand temporary overloads and sudden voltage surges . . . then specify an Empire insulated cable *in place of heat-resisting rubber.* The varnished cloth has the dielectric strength and resistance to both heat and aging needed for these tough services.

Speeds handling of cable joints

In maintaining widespread distribution systems, Empire seamless bias tape assists repairmen in making cable joints as reliable as the cable itself. *Easily handled* and *packed in oil,* the tape goes on smoothly and uniformly . . . to assure highest dielectric strength and freedom from moisture.

Improves performance of repaired motors

Whether it's a motor or generator, transformer or control . . . Empire gets them back on the job faster, gives you the same kind of coil and slot performance as the original equipment. In a variety of forms, this material combines *flexibility* that means easier handling with the *electrical characteristics* that keep down servicing and repairs.

IF THERE EVER was an insulating material of the moment – this is it! Empire Varnished Tape is saving valuable rubber in heat-resisting cable installations . . . saving time in making cable joints and motor repairs . . . and giving improved electrical performance in the bargain.

No matter how exacting your specifications, you will find these cotton and fiberglas yarns, impregnated with specially-developed Empire varnishes, give you the "tops" in performance from every standpoint: – higher temperature and moisture resistance; greater tensile breaking strength; minimum space factor; extra pliability and resistance to aging. And these properties are being proved every day in actual service as well as in laboratory tests by both equipment manufacturers and utilities.

To get varnished insulation at its best, send a brief description of your requirements to *Insulation Headquarters.* We will recommend the cloth and varnish best suited to your needs – and quote prices and delivery schedules promptly.

MICA INSULATOR COMPANY, 200 Varick St., NEW YORK. 600 Van Buren St., CHICAGO. 501 Marion Bldg., CLEVELAND.
Representatives in principal industrial centers.

Available through GRAYBAR

MICA INSULATOR COMPANY

MICANITE . . . EMPIRE VARNISHED INSULATIONS . . . LAMICOID LAMINATED PLASTIC MATERIALS

WHEN WHERE HOW

★ The grand strategy which the allied armies will follow has been determined. In this strategy lies the answers to today's questions—WHEN, WHERE and HOW.

★ The time, place and method of continental invasion soon may be revealed. Upon the development and prosecution of this strategy rests the future course of the war—and civilization. It is the hope of all that the consuming fire of the present conflict is but a refining process which will lead to a better world.

★ But the result lies beyond the horizon of today's perspective. We must continue to sail the charted course until we reach the Port of Victory.

★ At DELTA-STAR we have set our sails for this port. Our course has been changed to include wartime products in addition to those of peace. Our manufactured parts for implements of war are now serving on various fronts. More and more will follow until victory is won.

★ When peace comes again, the knowledge and experience gained from war work will be incorporated in peace-time production—insurance to our many friends that the DELTA-STAR trade-mark will continue to be a symbol of the highest quality switching equipment.

MACHINING AIRCRAFT PARTS

Some of our Regulator Products

AIR BREAK SWITCHES
- Type "PMB-36" (Horizontal Single-Break)
- Type "PM-36" (Horizontal Double-Break)
- Type "PM-23" (Horizontal Center-Break)
- Type "PM-23" (Horizontal Center-Break)
- Type "MX-36" (Rotating Insulator—Vertical Break Type
- Type "MB-169" (Rotating Insulator—Vertical Break Type
- Type "MB-239" (Rotating Insulator—Vertical Break Type
- Type "T-2" (Two-Insulator—Rocker Type)
- Type "T-3" (Three-Insulator—Rocker Type)
- Type "RT-2" (Two-Insulator—Rocker Type Rural Line)
- Type "RT-3" (Three-Insulator—Rocker Type Rural Line)

BUS BAR
- Clamps—Two, Three and Four-Bolt Types
- Tap Lugs—Solder Type, Clamp and Solder, Clamp Type
- Disconnecting Switches, Clamp Type

BUS SUPPORTS—Indoor and Outdoor
- Fixed Clamp Type
- Roller Clamp Type

CABLE SUPPORTS—110, 220 and 600 Volts
- For One or More Conductors
- Equilateral Type
- Horizontal Flat Type

CLAMPS
- Bus-Bar Clamps—Two, Three and Four-Bolt Types

CONNECTORS—Clamp Type, Solder Type
- End, Tee, Straight, and Parallel Types

CONTROL SWITCHES
CRANE RAIL SUPPORTS
DISCONNECTING SWITCHES—For Every Service
DISTRIBUTION CONNECTORS
FABRICATING—Steel Substations
FITTINGS—"Uniclamp" Type
FRAMES—For Pole Top Switches
FUSE MOUNTINGS—Indoor and Outdoor
FUSE SWITCH COMBINATIONS—Indoor and Outdoor
GROUNDING SWITCHES
GROUP-OPERATED SWITCHES—Indoor and Outdoor
METAL-CLAD SWITCHGEAR—Vertical Lift
MOTOR-OPERATED SWITCHES
MOTOR MECHANISMS
PIPE FITTINGS—"Uniclamp" Type
PLUG AND RECEPTACLES—Heavy Duty
POLE TOP SWITCHES
STEEL—Substations, Crossarms, Switch Frames
STRAIGHT CONNECTORS—Clamp Type, Solder Type
SUBSTATIONS—Outdoor
- Design.
- Fabrication of Structural Steel
- Electrical Equipment for Steel Tower Stations
- Electrical Equipment for Wood Pole Stations

POTHEADS—Indoor and Outdoor
TERMINATORS—For Cable
- 750 Volts and Below, Single and Multiple Conductor
- 2500 Volts and Above, Single Conductor
- 2500 Volts to 34.5 Kv., Multiple Conductor

LABORATORY FACILITIES
- Mechanical and Electrical Testing

Catalogs on Request

DELTA-STAR ELECTRIC COMPANY

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NEW YORK OFFICE — 140 Cedar St., New York, N. Y.

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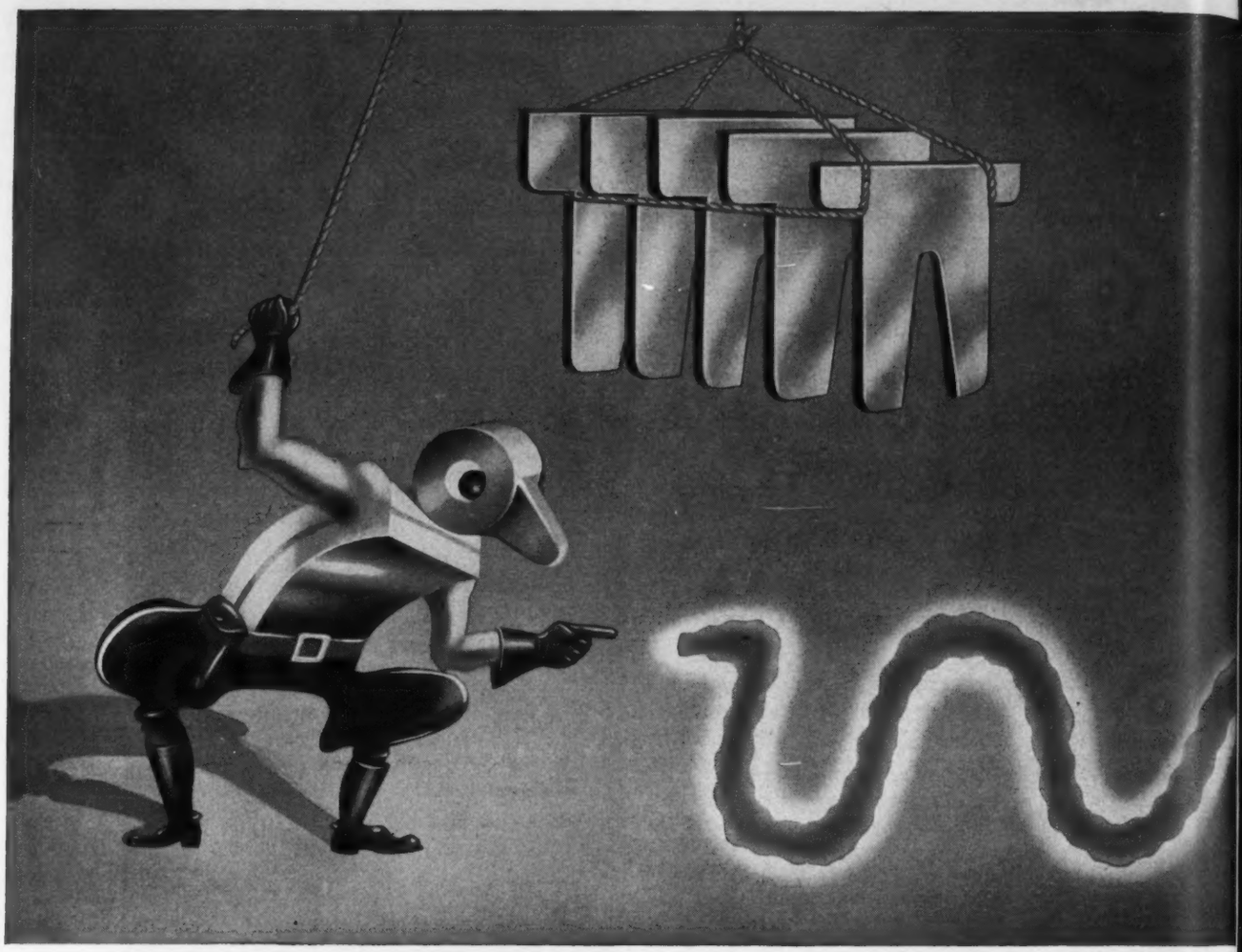
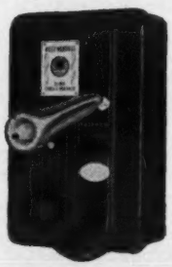
CANADIAN ASSOCIATE
Canadian Line Materials Limited ..... Toronto 13, Canada



"one false move and you're Dead!"

THIS IS THE BRAIN that tells whether an overload is dangerous or not. It's Westinghouse Bi-metal. Two different metals which react differently under heat are bonded together. Dangerous overloads cause this Bi-metal to bend, tripping the interrupting mechanism, opening the circuit.

THIS IS THE BRAWN that quenches the arc. Made up of parallel metal plates in the form of a grid, it draws the arc into the chamber, divides it into segments and smothers it between the plates . . . it all happens in the space of half a cycle!



Current that gets out of hand and threatens equipment or power circuits gets short shrift when the circuit is protected by Westinghouse "De-ion" Circuit Breakers.

With uncanny accuracy, this "De-ion" protective device outguesses the current, beats dangerous disturbances to the punch. Momentary, harmless overloads are passed without interruption; but when the circuit is actually threatened, the sensitive Bi-metal element goes into action, *quick!* The circuit's broken, the arc quenched, in the space of a blink of an eye.

It protects itself, too. The fast action minimizes arc effects, lengthens contact life. Its factory-set calibration is not disturbed. And, when the interruption has been corrected, a simple flip of the indicating handle restores service in seconds. No time lost locating a busy maintenance man; no parts to repair or replace.

Protect equipment and electrical circuits with Westinghouse "De-ion" Circuit Breakers. Ratings to 600 amperes; enclosures for any type of service. Call Westinghouse today. Westinghouse Elec. & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

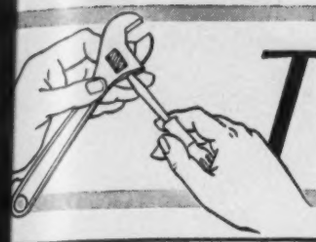
J-21267

WESTINGHOUSE

Westinghouse

PLANTS IN 25 CITIES . . . OFFICES EVERYWHERE

"DE-ION" CIRCUIT BREAKERS

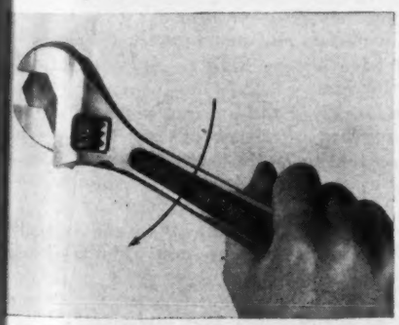


TOOL NOTES

"How To Do It" Information For Crescent Tool Users

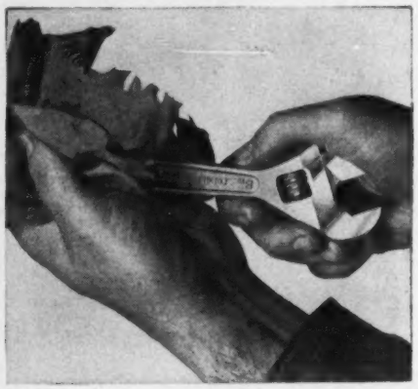
No. 11 HOW TO USE CRESCENT AND CRESTOLOY WRENCHES

A prime rule in using any adjustable wrench is to first adjust it to a snug fit on the nut to be turned. A tightly adjusted wrench is safer since danger of slippage is minimized. A loosely fitted wrench will tend to "round" the corners of hexagon objects, and may damage the wrench by exerting undue strains on the jaws.



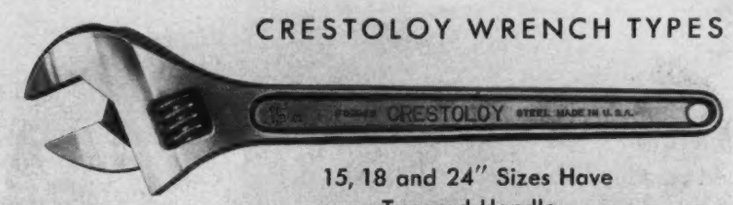
Adjustable Wrenches develop their greatest strength when hand pressure is applied to the side of the wrench carrying the fixed jaw as shown above. They can, however, be pulled in either direction on moderate loads, and are frequently "flopped" between swings to gain an angular advantage and permit continuous rotation of nuts or bolts where cramped quarters limit the handle swing.

"Crestoloy" Wrenches, being thinner (and stronger) than "Crescent" Wrenches are the preferred tools for use in cramped quarters or when adjustable wrenches are used in pair as shown in center illustration. For extremely heavy loads, Crestoloys, likewise, are recommended.



Greasy, oil-covered tools are dangerous. Keep the handles clean and dry by occasional wiping. Oil should be applied sparingly to moving parts.

CRESTOLOY WRENCH TYPES



15, 18 and 24" Sizes Have Tapered Handle

4, 6, 8, 10 and 12" Sizes Have Conventional Handle

USE THE PROPER SIZE WRENCH FOR THE JOB

Crescent and Crestoloy Wrenches are made in several sizes to handle efficiently a wide variety of work. Select proper size rather than overload the wrench. Handle lengths of all wrenches, up to and including the 12" size, are carefully computed to provide safe leverage at maximum opening. The tapered handle Crestoloy Wrenches, shown above, are designed to permit use of a pipe extension on the handle.

MAIL THE COUPON . . . for Free Reprints of this series of informative ads. Please indicate whether you want them for bulletin board use, or punched for 3-ring binder.

CRESCENT TOOLS
Give Wings to Work

CRESCENT TOOL COMPANY, JAMESTOWN, N. Y.

Crescent Tool Co., Jamestown, N. Y. B-4
Please send your "TOOL NOTES" Series
☐ for Bulletins ☐ for 3-ring binder

Name _____

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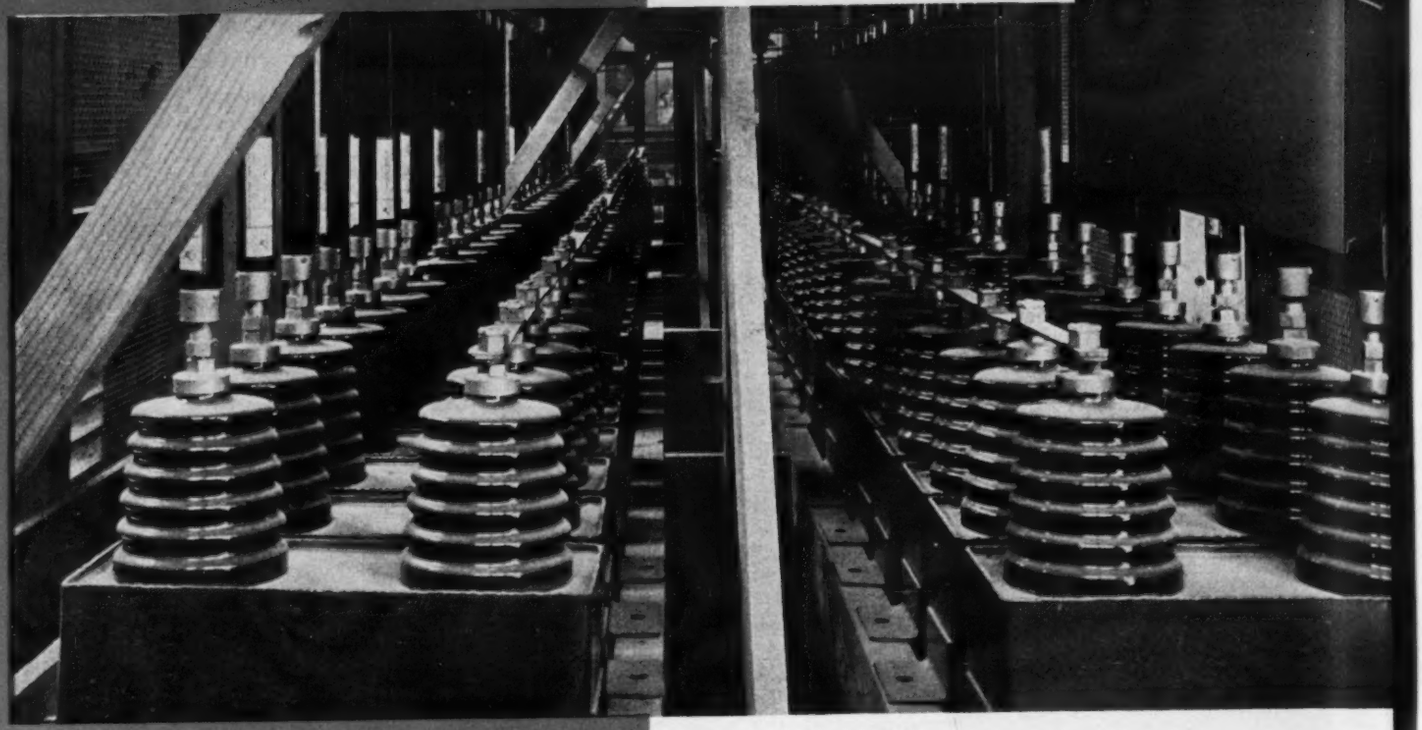
SATISFYING KILOVAR REQUIREMENTS OF LARGE LOCALIZED WAR LOADS...



with C-D Capacitors!

Many systems have solved the problem of supplying the reactive requirements of large localized war loads by using standard C-D capacitors in banks. Not only has this method increased the voltage level at critical load points, but it has also increased the working load capacity of the entire system. C-D capacitor installations in banks up to 50,000 kva are now serving the war-time requirements of many localities. The advantages of this method can very well apply to the requirements of your system. Why not consult with our engineers today? Cornell Dubilier Electric Corporation, South Plainfield, New Jersey.

10 REASONS WHY C-D CAPACITORS OFFER TH BEST SOLUTION FOR LARGE BLOCKS OF KILOVAR

1. C-D Capacitors are available on relatively short notice.
2. C-D Capacitors can be located at or near the load with mini mum use of critical materials and man-hours.
3. C-D Capacitors will have a very high re-use value elsewher on the system after the war.
4. C-D Capacitors can be installed and put into operation in a fra tion of the time required for other types of corrective equipment
5. C-D Capacitors are extremely flexible—circuit arrangement wi permit the switching of corrective capacity to conform to loa requirements.
6. C-D Capacitors are extremely mobile — they can be quickl removed to other locations to relieve sudden unforeseen low power-factor conditions.
7. C-D Capacitors offer the most efficient reactive source an require a minimum of maintenance and attention.
8. C-D Capacitors are durable. Impregnated and filled unde vacuum with non-inflammable and non-explosive Dykanol. Her metically sealed in non-corrosive welded containers. Equippe with sturdy, glazed, porcelain bushings.
9. C-D Capacitors are dependable. Engineered and manufacture by specialists who have made "capacitors" their exclusive busi ness for over thirty-three years.
10. C-D Capacitors have a proven record of performance. There are more C-D Capacitors in use today than any other make

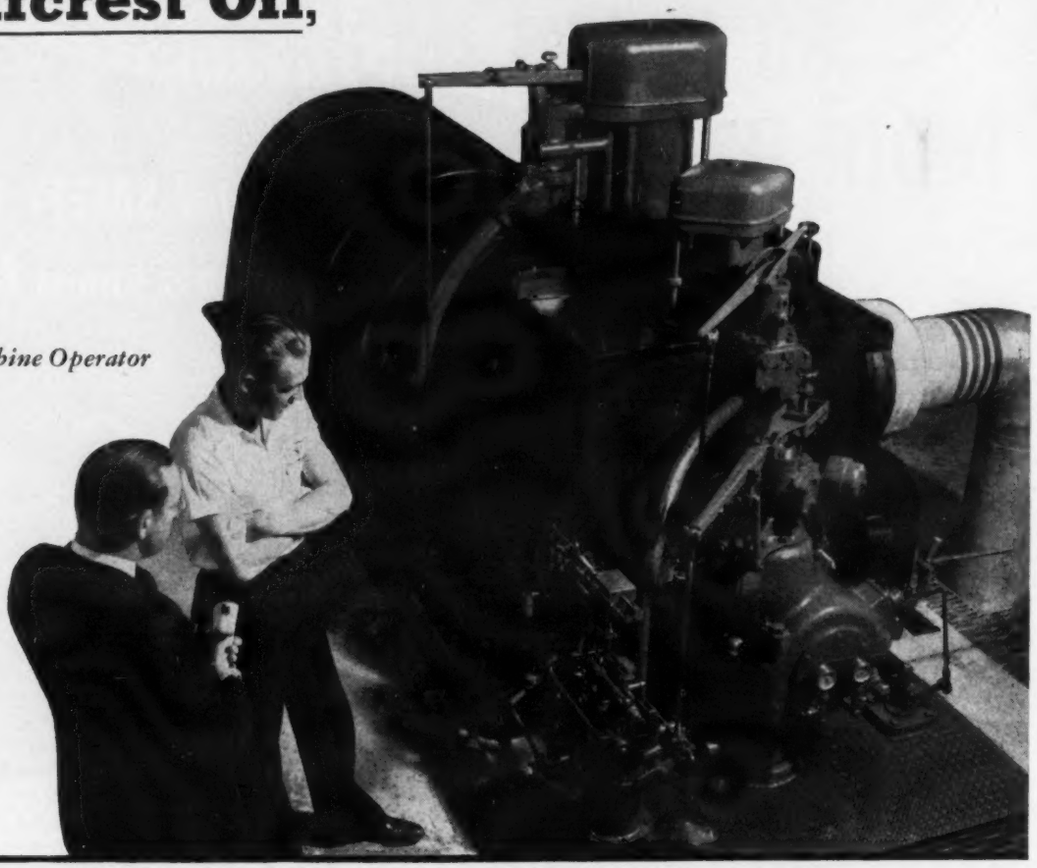
Cornell Dubilier capacitors

FOR POWER-FACTOR CORRECTION

CORNELL-DUBILIER CD CAPACITORS

"Our annual inspection proved again the higher lubricating value of **Gulfcrest Oil**,"

says Turbine Operator



Actual plant photo of a Gulf Lubrication Service Engineer (left) consulting with Turbine Operator of the world's largest cigarette paper mill on steam turbine lubrication.

"All lubricated turbine parts — and the oil in the reservoirs — were found to be in their original condition."

"When we recently dismantled this turbine for inspection, it showed the results of excellent lubrication," says this Turbine Operator. "All lubricated parts were found to be in their original condition, with no measurable wear. The oil in the reservoirs was also in perfect shape. This inspection proved to us again the higher lubricating value and greater stability of Gulfcrest Oil."

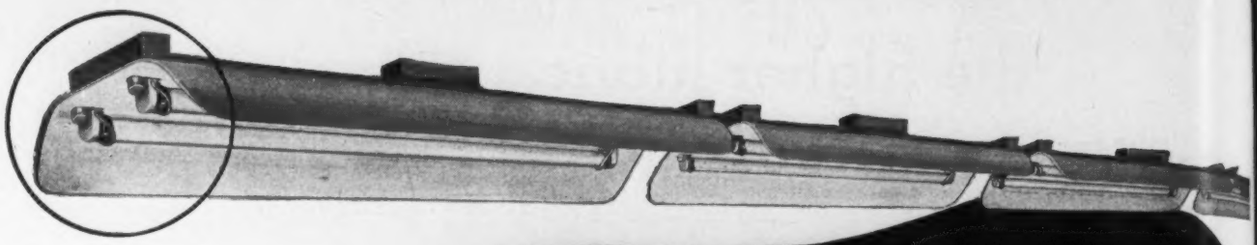
Here is the important reason why Gulfcrest Oil has such an outstanding record of performance in steam turbine lubrication: Gulfcrest Oil is not only refined from the best selected crude oils—it is *super*-refined by the Gulf Alchlor Process, the most effective method known for removing the undesirable constitutents present in all crudes. Thus Gulfcrest Oil has highest resistance to oxidation, acidity and sludge, and provides maximum protection to turbine bearings. Gulfcrest Oil is the world's finest oil for turbine lubrication!

Ask the Gulf Lubrication Service Engineer in your vicinity to tell you more about this unmatched turbine oil at your earliest opportunity. He will be pleased to give you complete details, without obligation.

GULF OIL CORPORATION
GULF REFINING COMPANY
GULF BUILDING, PITTSBURGH, PA.

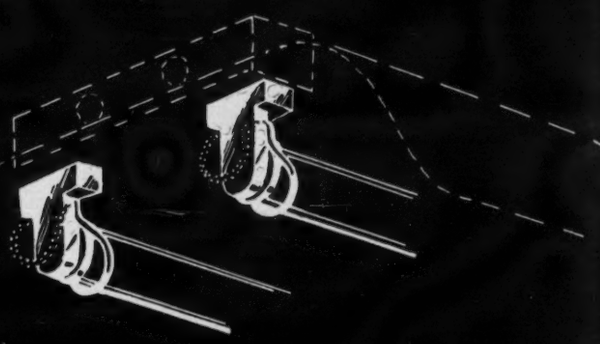
GULF INDUSTRIAL LUBRICATION

MILLER DOES IT AGAIN!



...with a patented SAFETY LAMP LOCK which prevents lamps from falling!

STUDY CAREFULLY *the details of the MILLER patented Safety Lamp Lock as shown at the right. It is an integral part of each socket—prevents lamps from falling.*



There are several highly significant features of the new MILLER Aero-Designed fluorescent fixture, and its compliance with WPB regulations limiting the use of steel.

Of all features, none is more noteworthy than the MILLER Safety Lamp Lock. The vital spots where it gets in its good work are shown in the circled sockets in the continuous run of fixtures at the top of the page, with the details diagramed immediately above.

It is an extremely important feature to you . . . because it minimizes the risk of lamps falling from sockets. Fool-proof under all conditions, it can mean the saving of time and money in your busy plant . . . yes, the prevention of dangerous accidents, too.

This Safety Lamp Lock is *exclusive* with MILLER. It's a product detail that undoubtedly is one of the best available demonstrations of the constant alertness of MILLER lighting engineers in your interest. It's your best reason for calling in a MILLER field engineer (located in principal cities) today, to talk more about this Aero-Designed fluorescent lighting, and how it can help you.

Other Noteworthy features

FLANGED TOP CHANNEL *simplifies installation—saves labor.*

"EXTRA LENGTH" REFLECTORS—*shield lamp ends—of sturdy Masonite with reinforcing attachment straps.*

IVANITE *the "sealed-in-surface" finish—durable, easy to clean, high reflection factor.*

STREAMLINED—*completely wired channel with exposed ballast for heat dissipation.*

THE MILLER COMPANY • MERIDEN, CONNECTICUT

ILLUMINATING DIVISION
Fluorescent, Incandescent
Mercury Lighting Equipment

OIL GOODS DIVISION
Domestic Oil Burners
and Liquid Fuel Devices

ROLLING MILL DIVISION
Phosphor Bronze and Brass
in Sheets, Strips and Rolls

WAR CONTRACTS DIVISION
War Materiel

MILLER
SINCE 1844

A 100% RECORD

Awards on May 8th, 1943 to two plants in Kenosha, Wisc., completed this 100% record for The American Brass Company.

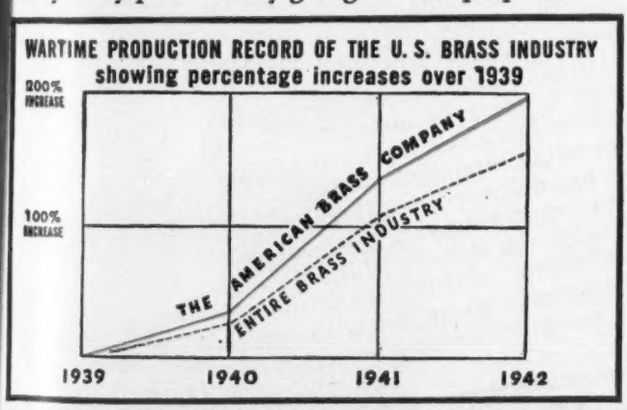
ALL TEN AMERICAN BRASS CO. PLANTS IN U. S. A. HAVE EARNED RIGHT TO FLY ARMY-NAVY "E" FLAGS

This is the story in terms of war production

Our Connecticut plants were among the first in the brass industry to receive the coveted "E" Award for outstanding production of war materials. Since then *all* our plants, including those in the States of Michigan, Wisconsin and New York, have been similarly honored.

As the largest fabricator in the copper and brass field, The American Brass Company is keenly aware of its responsibility and its opportunity to serve the cause of the United Nations.

Since 1939, production has been tripled, with virtually every pound today going for war purposes.



This chart*, based on 1939 peacetime production, shows the rapid swing into all-out war production, both by the copper and brass fabricating industry and The American Brass Company (not including Government-owned plants). All-time production records have been continually broken ever since the National Defense Program was initiated in 1940.

*Based on compilations of The American Bureau of Metal Statistics

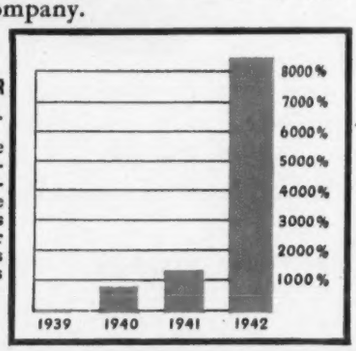
This record was accomplished by close cooperation between management and labor . . . careful planning for rapid conversion to wartime operations . . . intensive training of new personnel . . . plus efficient utilization of existing and new plant equipment.

Detailed figures, of course, cannot be revealed, but The American Brass Company is consistently breaking all previous volume records. In addition to its U. S. plants and that of a Canadian subsidiary, Anaconda American Brass Ltd., the company's production also embraces three plants operated for the United States and Canadian Governments.

Shipments this past January were the largest in the company's history. March exceeded January. The first quarter of '43 was by far the greatest tonnage quarter in the records of the company.

PRODUCTION OF COPPER ALLOYS FOR AMMUNITION by The American Brass Co.

This chart shows the vast increase in production of copper-base alloys directly earmarked for ammunition in plants operated by The American Brass Company. This is one of the most vital needs for copper and brass. Tremendous quantities are required for all types of ammunition.



The American Brass Company is proud indeed that all the plants it operates in the U. S. A. have won the honor of flying the Army-Navy "E" for excellence in production. But it is even prouder of the organization and the will-to-produce that have made this record possible . . . *and will keep it going.*

431840

THE AMERICAN BRASS COMPANY

ANACONDA

Subsidiary of *Anaconda Copper Mining Company*

BUY ALL THE BONDS YOU CAN AFFORD . . . TURN IN ALL THE SCRAP YOU CAN FIND

An Editor takes his pen in hand...

[Reproduction of an editorial in The Dallas Morning News, June 3]

...one so. ...ssed a sim

Power for Victory

In the war news, the big headlines go to the air raids, the commando landings and the taking of large territories and great cities. The loudest acclaim naturally goes to those who take the biggest risks and make the most sensational achievements. Yet full credit should also go to those on the home front whose daily service is essential to victory. This vast group includes not only those who build ships, planes, tanks and other war equipment but every person who works faithfully in an industry that is bolstering the war effort.

The electric power industry, for instance, is one without which no other war industry could operate. There must be power for the lathes, punches, riveters and other machines that make our war weapons, power to light our factories for night shifts, power to take workers from their homes to their jobs and back. One of our main defense aims is to protect our power plants; one of the main objects of our bombers is to destroy the enemy's generating plants.

General Cable Corporation, which makes wires and cables through which electric power is transmitted, does well to call public attention * to what the power industry is doing to hasten the day of victory. This industry has given the United States more electric generating capacity than all the rest of the world and has delivered this power to the places where it was most needed and could most readily be harnessed to the war effort. In this and other essential industries, every worker should know that victory depends on his doing his part and should have recognition for unusual performance.

...rmoil in Y...oslav...

...hose w...

*

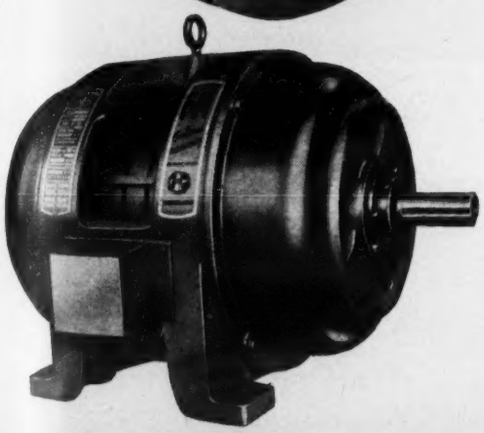
The advertisement referred to by this editor was only one of a series we have been running. Others called attention to the equally vital service of the men of our Railroads, Communications Companies, Electrical Wholesalers and Contractors.

GENERAL CABLE

CORPORATION

MANUFACTURERS OF BARE AND INSULATED WIRES AND CABLES FOR EVERY ELECTRICAL PURPOSE

When You Can't Buy 'em *BIG*—Buy 'em *GOOD!*



REALLY, it's no hardship when you have to buy smaller motors. *You save money.* But remember, when you can't buy 'em big—buy 'em good.

Now that you cannot depend on oversize to take your motors through tough service—you must depend on quality.

That is why you should investigate Fairbanks-Morse Motors with *Copperspun* Rotors.

The winding of the *Copperspun* Rotor is centrifugally cast of COPPER in one piece. It provides electrical and thermal characteristics that give this motor the stamina to stand up under the most severe service without mechanical failure. You can operate a Fairbanks-Morse Motor with *Copperspun* Rotor at its full rated capacity continuously and indefinitely without fear of damage from overloading.

Fairbanks, Morse & Co., 600 S. Michigan Ave., Chicago, Ill.

Copperspun

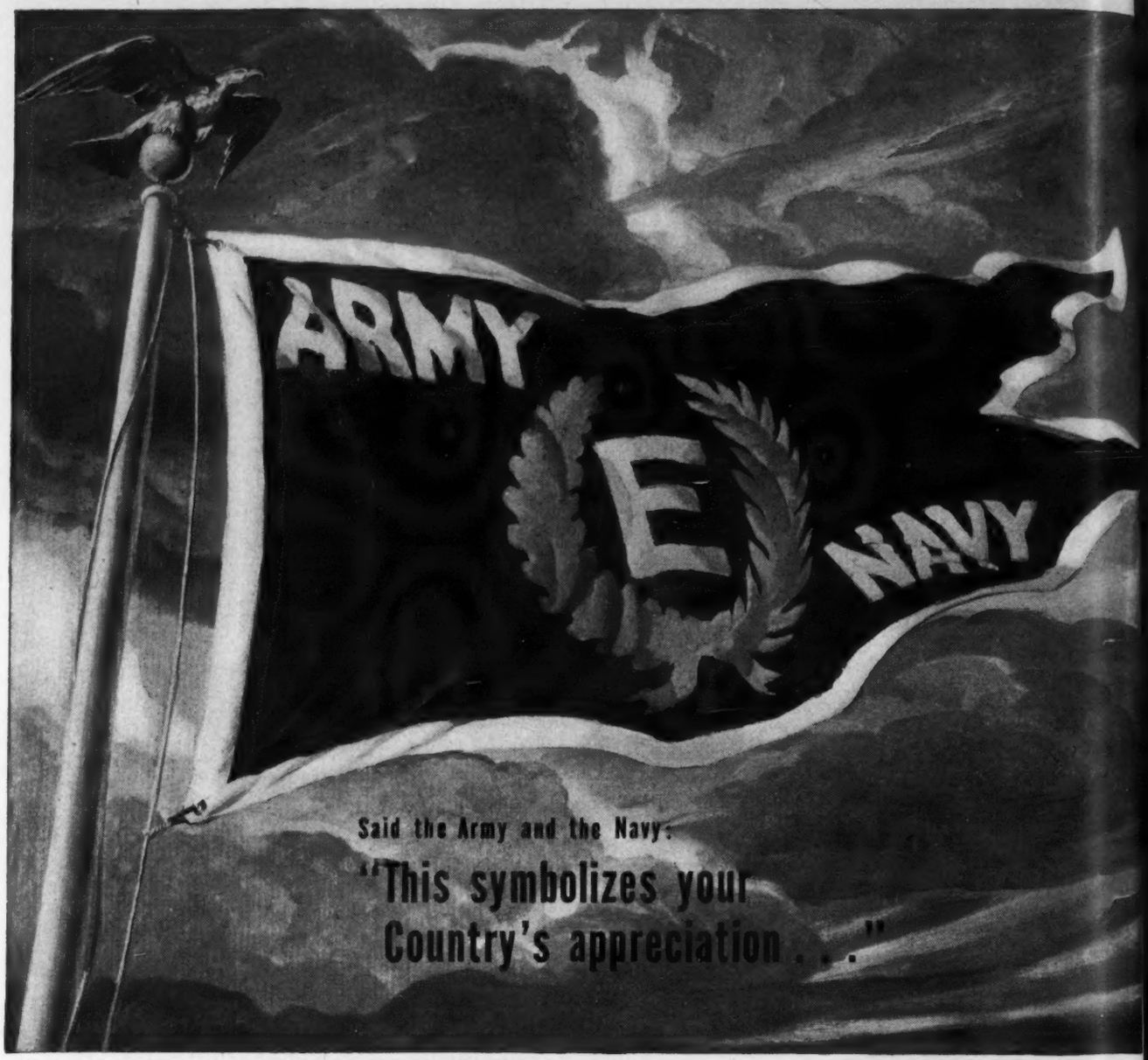
FAIRBANKS-MORSE

DIESEL ENGINES
PUMPS
ELECTRICAL MACHINERY
SCALES
MOTORS

WATER SYSTEMS
FARM EQUIPMENT
STOKERS
AIR CONDITIONERS
RAILROAD EQUIPMENT

F M

Motors



There it flies
The coveted
Army-Navy "E" . . .

We can't tell you
Very much about
The electronics research
That won it . . .

Such matters are
Wartime secrets . . .

But this we *can* say . . .
In the words of
The Army and Navy
This pennant
Represents
"Great accomplishment
In the production
Of war equipment."

Today
Modern radio equipment
Designed and developed
By the Laboratories Division of
Federal Telephone and Radio Corporation
An I.T.&T. Associate
Is helping Uncle Sam's fighting forces
Work together
On land, sea and in the air . . .

Tomorrow
It will help build
A better world
For every man.

THE LABORATORIES DIVISION OF
Federal Telephone and Radio Corporation
67 Broad Street, New York, N. Y.

AN I T&T ASSOCIATE

This CONSERVATION PLAN

will help you

SAVE MAN-HOURS...

SAVE MATERIALS...

SPEED PRODUCTION

1. Conserve

by strategic selection, application and use of electrical equipment.

EXAMPLE

Standard gearmotors or speed reducers save materials required by sheaves, belts, chains and line shafts. In addition, they commonly effect power or energy savings up to 10.5%.

2. Conserve

by utilizing new developments that reduce need for critical materials and man-hours.

EXAMPLE

X-ray inspection detects defective castings or welded sub-assemblies before they are machined or assembled. It replaces "destructive" tests . . . reduces rejects . . . eliminates wasted machinery man-hours.

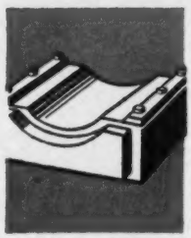
3. Conserve

by utilizing available facilities for preventing breakdowns and reducing machine outages.

EXAMPLE

"Maintenance Hints" — a complete, pocket-size manual covering recommended upkeep practice for electrical apparatus—is a maintenance help available without charge. Check your Westinghouse representative for copies.

4. Conserve



by utilizing materials which in many cases can replace critical materials and do a better job.

EXAMPLE

Micarta, a heavy-duty industrial plastic, outwears other materials in many bearing applications. Typical of many uses are steel mill roll neck bearings and marine stern tube and pintle bushings.

5. Conserve

by tapping all sources of salvageable scrap.

EXAMPLE

Systematic planning can uncover many ways of reclaiming worn equipment and waste material. Samples of salvage forms and organization charts in use in Westinghouse plants will gladly be made available on request.

Wartime Conservation means MORE than just conserving copper, steel, aluminum . . . it means the most strategic possible use of all of the ingredients of Victory—materials, man power, time and ingenuity.

These five major points comprise a complete program developed by Westinghouse for Wartime Conservation. This program packages up Westinghouse engineering experience in the entire field of electric and power equipment and related materials. Examples noted are but five of many specific recommendations.

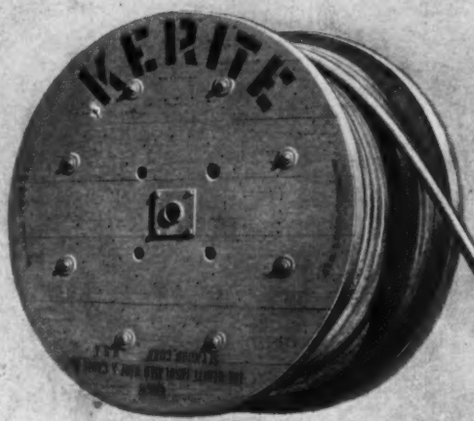
This experience and these recommendations are offered fully and without obligation.

Ask your Westinghouse representative today for a copy of the new 100-page book, "WARTIME CONSERVATION." Or write direct to Dept. 7-N, Westinghouse Electric & Manufacturing Co., East Pittsburgh, Pa.

J-90481

Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE



KERITE

in over three-quarters of a century of *continuous production*, has spun out a record of performance that is *unequalled* in the history of insulated wires and cables

1943
Another Year added *to the* Performance Record *of* KERITE

THE KERITE INSULATED WIRE & CABLE COMPANY INC
NEW YORK CHICAGO SAN FRANCISCO

ELECTRICAL WORLD • JUNE 26, 1943

MONOPOLY AND COMPETITION

The change from a regulated monopoly to a regulated competitive business which has been going on in the utility industry for several years has not been completed, nor will it be until the several characteristics of competition are reflected down into the basic thinking of management. It isn't enough to admit that the business is competitive. One must go further and seek the concomitants of competition.

The foundation of successful utility operation has always been return on investment. Thinking started at that point. Rates were made on that premise. And as long as the business was strictly a monopoly, with regulation defending if not guaranteeing the return, this principle gave assurance to the financial stability of the operating companies.

Under such conditions, however, there were not the same incentives that stimulate a business which has no defender of its return yet must meet competition. Increasing taxes and other costs of the past decade have brought economies of plant and capital operation, but these cannot be attributed so much to a fundamental change in economic perspective as to protection of investment return.

In a competitive business there is the same eagerness to secure a fair return on invested capital, but the approach is different. Return in a competitive business comes from expansion in sales—from volume. Programs are made on the basis of doing so much business. If the goal is reached the return on investment will follow.

In a competitive business one does not start with a rate that will produce a return and struggle to build business at that price. Just the opposite; one sets a goal and then finds out what price is necessary to reach that figure. The costs are adjusted to make that price bring a return on the estimated volume.

What is the difference? Just this, that growth under the monopolistic concept is necessarily slower than under the competitive concept. Rates in one case are protective of investment, while in the other they are volume creative. Employees under the latter have less security, perhaps, but more opportunity.

Undoubtedly the large investment per dollar of gross as compared with manufacturing or retailing business has made utility management extremely conscious of this factor. May it not be possible that operations in the competitive manner will improve this investment ratio?

In any event it is extremely likely that the rates which will result in volume sales expansion, because they represent what the customer is willing to pay, will erase any important advantages that might otherwise be enjoyed in publicly served areas.

There are a great many advantages to the competitive economy that could never be enjoyed by a monopolistic operation.

Chlorinated Condensing Water Averts Cleaning, Saves Fuel

Frequent plug cleaning of tubes wholly obviated by chlorination of circulating water at Millers Ford station — Fuel saved by higher vacuum — Total yearly savings $11,000 in seven-year period

R. D. GILLESPIE and L. P. SUDRABIN,† Dayton Power & Light Company*

INTERMITTENT chlorination of the condenser cooling water at the Millers Ford station of the Dayton Power & Light Company, Dayton, Ohio, during the past seven years has proved to be satisfactory. It has eliminated the need of plugging the condenser tubes and has resulted in marked savings.

Many inland steam-generating plants which have expanded their capacity because of the increased demand for electric power have had the problem of obtaining the fullest advantage of their existing condenser cooling water supply. This was the case at the Millers Ford station.

Plant Expansion

Although there were signs of war in Europe in 1936, there were no sure indications that war was inevitable for America, yet the dreaded possibilities were there, and in view of the fact that the industries of Dayton and the surrounding Miami Valley would likely be called upon to furnish the materials of war again, as it did in 1917 and 1918, the decision was reached that we would expand and prepare our facilities in readiness for any emergency. A program was therefore conceived to increase the capacity of Millers Ford station from 110,000 kw. to 187,500 kw. The capacity was increased by the installation of four 1,375-psi. boilers with a total steam temperature of 900 F. and with a capacity of 375,000 lb. per hour each. Two 30,000-kw. high-pressure topping turbines were installed to exhaust into existing low-pressure turbines at 230-psi. and 575 F. One of the original 12,500-kw. turbines was replaced by a 30,000-kw. low-pressure condensing unit, bringing the station capacity to 187,000 kw.

Millers Ford station is located on the Great Miami River at the southern outskirts of the city of Dayton. The Miami River has four main tributaries, three of which join within the city above the station. In the year 1913 nearly all of Dayton was inundated by a flood, yet every summer the water flows slowly along a narrow portion of the river channel. After the 1913 flood five normally dry retarding dams were built by the Miami Conservancy, to regulate the flood-waters of the Miami River and its tributaries, and thereby eliminate the possibility of future floods in Dayton and the Miami Valley.

Millers Ford station has a total of

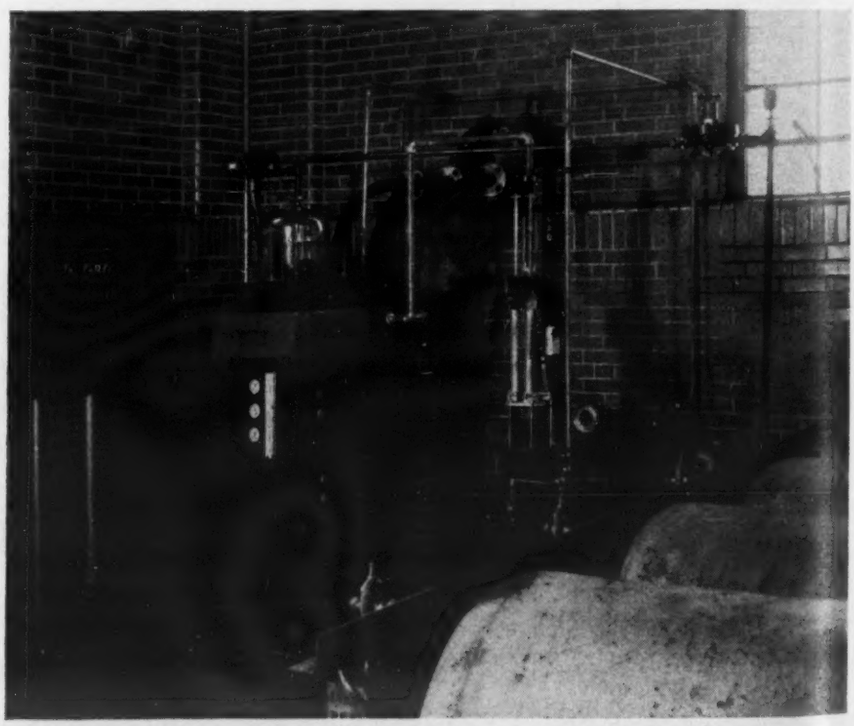


FIG. 1—Chlorinator installation at Millers Ford initially applied to suction of three 40,000-g.p.m. circulating pumps

* Manager Power Production, † Chemist.

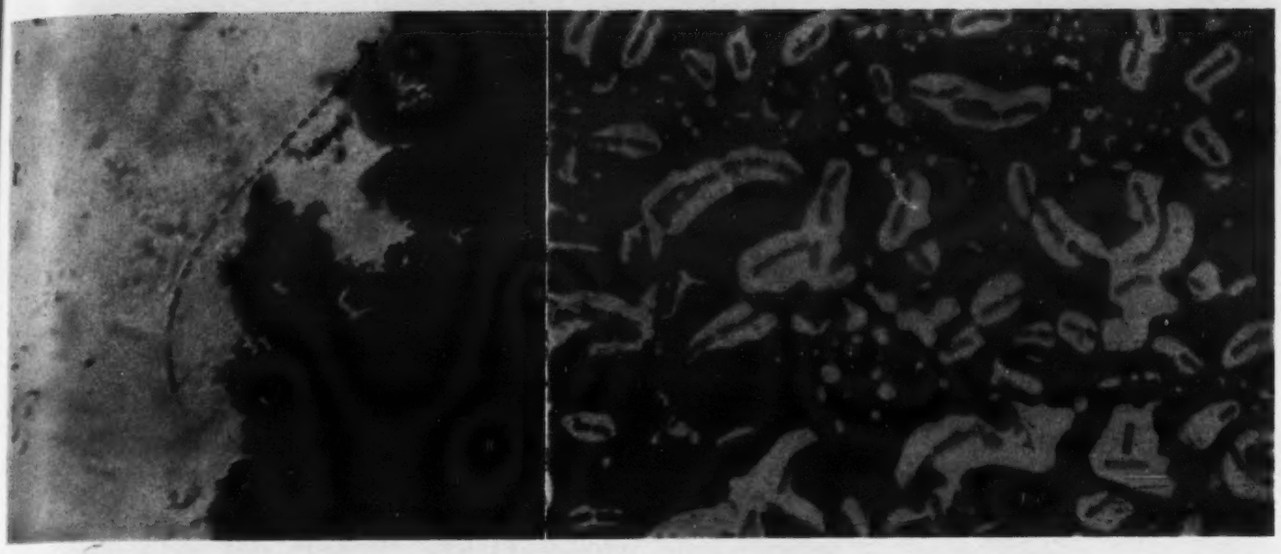


FIG. 2—Tube slime consists of inorganic matter held to surface by filamentous bacteria; microphotograph shows crenothrix (magnified 400 times)

FIG. 3—Mucoid colonies and large capsulated bacilli also found by culture (magnified 900 times)

127,500 kw. in low-pressure condensing capacity, consisting of six units ranging in capacity from 12,500 kw. to 30,000 kw. which require 220,000 g.p.m. of condenser cooling water; all of this condenser cooling water is supplied by the Miami River. Surface condensers are of the horizontal two-pass type, equipped with 1 in. O.D. No. 18 B.W.G. muntz metal tubes and muntz metal tube sheets. The tubes are rolled and belled at the inlet ends and are packed at the outlet ends.

During the summer months the flow of the river often falls below the demand for condenser cooling water. The first step in the expansion program was to install a low-head dam across the river about 500 ft. below the condenser intake, to impound the water and to provide a reserve. This dam facilitates the recirculating of the condenser cooling water to supply adequate steam-condensing capacity during low river flow periods.

Frequent "Plugging" Necessary

Prior to the installation of the dam considerable trouble was encountered with slime accumulations in the condensers. The slime was removed by the conventional method of blowing rubber plugs through the tube, and also by washing with high-pressure water. This was a weekly procedure on each condenser during the six warm months, and a somewhat less frequent procedure during the six cooler months. After cleaning the tubes the condenser vacuum was improved by about 0.5 in. Hg. The absolute back pressure would gradually rise when the machine was placed in service and within a week it would be necessary to plug the tubes again. Realizing that the recirculation of the condenser cooling water would increase the tendency for slime to form, steps were taken to eliminate the slime formation. Intermittent chlorination was considered as the most likely solution for the slime problem, since this type of treatment had proved to be successful and economically feasible elsewhere.

Biological Survey

A preliminary microscopic examination of the slime showed it to consist of inorganic matter bound to the inner surface of the condenser tube by filamentous forms of bacterial growth. Further examination of the microorganisms revealed the presence of considerable crenothrix (Fig. 2) and other bacteria and bacterial zooglea. Destruction of the interlacing filamentous structure and the capsulated bacteria (which exude a jelly-like substance through their sheaths) by chlorination eliminates the binder for the inorganic matter suspended in the cooling water. In this manner the condenser tube surfaces are kept clean.

The microorganisms were streaked on Nutrient and Sabouraud's agar. A moderate growth of mucoid colonies and large capsulated bacilli were cultured on Sabouraud's agar (Fig. 3).

The "time of killing" study made by suspending the growths in a saline solution and treating with varying amounts of HOCl showed that practically complete killing was obtained by maintaining a chlorine residual of 0.5 ppm. for a contact period of five minutes.

Chlorination Initiated

On November 15, 1935, chlorine was first applied to the suction of three 40,000 g.p.m. circulating pumps, on a schedule of eight minutes chlorination to each condenser each 90 minutes, by means of a Wallace and Tiernan master visible type chlorinator, (Fig. 1). The intermittent chlorination schedule was adopted rather than continuous chlorination, primarily because of the cost of the chlorine and because it had been noted that fouling of the condenser tubes can be prevented if the organisms are killed at sufficiently frequent intervals so that the inorganic suspended matter was not bound in place.

The chlorinator was installed in the screen house building, which is located over the condenser cooling water intake some 60 ft. from the condenser room. It was chosen because it was insolated from the rest

of the plant and had ample room for the chlorinator and for four one-ton liquid chlorine tanks. In case of leaks the building can be easily ventilated without any danger to the generating equipment.

The Wallace and Tiernan chlorinator has a maximum delivery rate of 2,000 lb. of chlorine every 24 hours. This can be regulated by a master rate controller to meet the demand for chlorine on each individual unit. The chlorine is delivered to the chlorinator as a gas and is discharged as a solution in water through rubber-lined piping to the suction of the circulating pumps.

Operating Cycle

In the operating cycle of the chlorinator there are three steps, namely the primary period, the chlorination period and the flushing period. In the primary cycle full flow of water is established, clearing the solution piping of any residual chlorine. This is accomplished by a scheduled electrical system which opens the necessary valves, including the solenoid valve at the suction of the circulating pump to be treated. This period requires approximately two minutes.

During the chlorination period chlorine is admitted to the injectors at the rate prescribed by the master rate controller. The chlorine supply is closed at the end of eight minutes. This is followed by the flushing period, which continues for two minutes. During the flushing period the chlorinator and chlorine solution piping are freed of chlorine. At the completion of the flushing cycle the system is ready to apply chlorine to the next condenser scheduled for treatment.

Maintained Dosage

Chlorination is applied the year round, even though the maximum slime growth occurs in the summer months. A dosage of 1.25 ppm. chlorine proves to be adequate to maintain a residual of 0.5 ppm. during summer and winter. The winter chlorine demand approaches that of the summer because of the increased suspended matter present in the cooling water. Occasionally during high water periods no chlorine can be detected with the previously mentioned dosage. It has been noted that the suspended inorganic and organic matter has abrasive properties during high-water periods and cuts any accumulation that may have formed in the absence of chlorine residuals.

Residuals Determined

The chlorine residuals are determined at frequent intervals with a Hellege chlorine comparator.

On November 16, 1936, the chlorine dosage schedule was changed from eight minutes of treatment every 90 minutes to eight minutes of treatment every 180 minutes. This resulted in halving the chlorine used by each condenser and permitted the treatment of the three other condensers with the original chlorinator. The reduction in the frequency of chlorination did not reduce the effectiveness of chlorination in preventing slime growth.

The necessary scheduling equipment, piping and solenoid-operated solution valves were installed for No. 3 condenser on May 13, 1936, and for No. 1 and No. 2 condensers on February 17, 1937.

Results of Chlorination

In the seven years that chlorination has been applied to the condenser cooling water at the Millers Ford station the cooling water side of the condenser tubes has been kept free of all slime deposits, resulting in an average increase in vacuum of 0.25 in. Hg. during the summer months and 0.1 in. Hg. during the six winter months. An additional 0.05 in. Hg. is obtained because the thin residue of slime which had been compacted on the tube surfaces by the mechanical cleaning process is no longer present when chlorination is used. This makes a total of 0.3 in. Hg. gain in vacuum during the summer months and 0.15 in. Hg. in vacuum during the winter months.

The 0.3 in. Hg. over-all vacuum improvement during the summer months has reduced the low-pressure turbine water rate by 1.5 percent. Similarly the 0.15 in. Hg. over-all vacuum improvement has reduced the low-pressure turbine water rate by 0.75 percent during the winter months. This reduction of the low-pressure turbine water rate, when corrected for the effect of the topping turbines and converted into fuel savings, represents $9,888.29 yearly.

The disagreeable job of climbing into vile-smelling condenser water boxes to clean the tubes, by the plug blowing method, is no longer necessary. Besides eliminating a disagreeable and unsanitary task, chlorination has resulted in a yearly labor saving of $4,076.80.

Annual Savings

Cost data of chlorination during 1942 are as shown in the following table:

Fuel savings per year	$9,888.29	
Labor savings per year	4,076.80	
Gross labor and fuel savings per year		$13,965.09
Chlorine cost per year	1,024.80	
Equipment depreciation of 13% per year	1,751.10	
Maintenance, control and handling	125.00	
Total operating charges		2,900.90
Net Savings		$11,064.19

The net savings alone should not be the criteria for the use of chlorination. Additional considerations should include the continuous availability of the condensing units at maximum capacity, the elimination of a dangerous, disagreeable and unsanitary job, the increased heat transfer characteristics which result in more efficient usage of the existing cooling water supply, etc.

There has been no evidence of chlorine causing any marked corrosion anywhere in the condenser cooling water system. It is more likely that the corrosion caused by bacterial activity has been prevented.

Precautions

All the chlorine connections are regularly checked with ammonia to detect leaks. In case any leaks are found proper measures are taken immediately to correct them. The chlorinator is overhauled and inspected twice yearly to note any defects in the working parts. In case the pressure regulating or makeup water valves of the chlorinator do not function properly, resulting in excessive water pressure on the chlorinating system, a signal light in the condenser room indicates this condition.

A chlorine mask is available, outside the building housing the chlorinator, to be used to enter the building whenever a severe leak might develop. Men are trained to apply the proper first aid measures in case of gassing.

An ABC Formula Guides Fuse Co-ordination

Examples show how simple it is to decide whether a branch should be fused so that less customer-minutes of outage will result than from reliance on a reclosing breaker at substation

R. F. QUINN, Central Station Engineering Dept., General Electric Co., Schenectady, N. Y.

EVERY distribution engineer knows that service continuity is greatly affected by the proper location of fuses on distribution circuits, but he does not know in numerical terms whether in every case he is or is not improving service by fusing. In some cases it is readily apparent what effect fusing will have on service continuity, but there are a great number of cases where it is not readily apparent whether fusing will be a benefit or a loss.

By means of a simple formula (abc $\gtrless$ ABC), using data that are readily available to the distribution engineer, it is easy to determine whether to fuse or not to fuse any branch on the system. The results of this formula will also show the degree of service improvement obtainable and give indication of where line reclosing devices would be most beneficial.

To apply this formula one simply needs to know:

1. The number of temporary and permanent faults or the ratio of temporary to permanent faults on the branch to be studied, which, throughout this discussion, will be termed "Branch X." If not available, 75–80 percent temporary faults is generally representative.

2. The time required to replace a blown fuse in Branch X, and also the time to locate and isolate a fault on Branch X if unfused.

3. The number of consumers on the feeder and on Branch X. If desired, kva. can be substituted for number of consumers in all formulas.

With these data, the use of this formula will show whether fusing a particular branch will decrease or increase consumer minutes outage (CMO) on a feeder.

Reclosing Substation Breaker and Single Element Fuses—This formula in its simplest form is based on using a reclosing circuit breaker at the substation that will protect the entire feeder by clearing all temporary faults with only a momentary outage of negligible duration and single-element cutouts out on the line. A simple case of a substation, a feeder and Branch X is shown in Fig. 1.

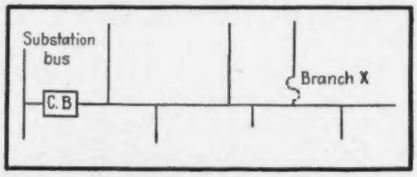


FIG. 1—Simple formula indicates whether Branch X shall or shall not be fused

C.B. = reclosing circuit breaker protecting entire feeder.
a = Number of temporary faults on Branch X.
b = Time to replace fuse of Branch X.
c = Number of consumers on Branch X.
abc = Consumer-minutes outage (CMO) caused on Branch X by fuse blowing on temporary faults on Branch X.
A — Number of permanent faults on Branch X.
B — Time to determine that Branch X is faulted, and to isolate it.
C — Number of consumers on entire feeder, exclusive of Branch X.
ABC — Consumer-minutes outage (CMO) on entire feeder exclusive of Branch X caused by permanent fault on unfused Branch X.
When abc = ABC the total CMO of feeder is the same whether Branch X is fused or is not fused.
When abc > ABC fusing Branch X increases total CMO of feeder.
When abc < ABC fusing Branch X decreases total CMO of feeder.

Fusing Branch X causes outages on this branch as a result of the fuse blowing on temporary faults. These outages would be cleared by the reclosing breaker if Branch X was not fused; "abc" is the CMO resulting from these outages, since:

(a) = the number of temporary faults on Branch X.
(b) = the time to replace the fuse in Branch X.
(c) = the number of consumers on Branch X.

However, if Branch X is not fused, permanent faults on it will cause the substation breaker to lock out, resulting in outages on the entire feeder. The CMO for the consumers on Branch X caused by permanent faults is the same whether Branch X is or is not fused and, therefore, is excluded. Thus ABC is the total CMO for the consumers on the rest of the feeder resulting from permanent faults on unfused Branch X, since:

(A) = the number of permanent faults on Branch X.
(B) = the time to determine that Branch X is faulted and to isolate it.
(C) = the number of consumers on the feeder (less Branch X).

The CMO caused by faults on any other part of the feeder will not be changed by fusing Branch X and thus is neglected. Therefore,

If abc = ABC the total CMO is the same whether that particular branch is fused or is not fused.
If abc > ABC fusing that particular branch will increase the total CMO for the entire feeder and the difference between the two figures is the actual increase in CMO is Branch X is fused.
If abc < ABC fusing that particular branch will decrease the total CMO for the entire feeder and the difference between these two figures is the actual decrease in CMO if Branch X is fused.

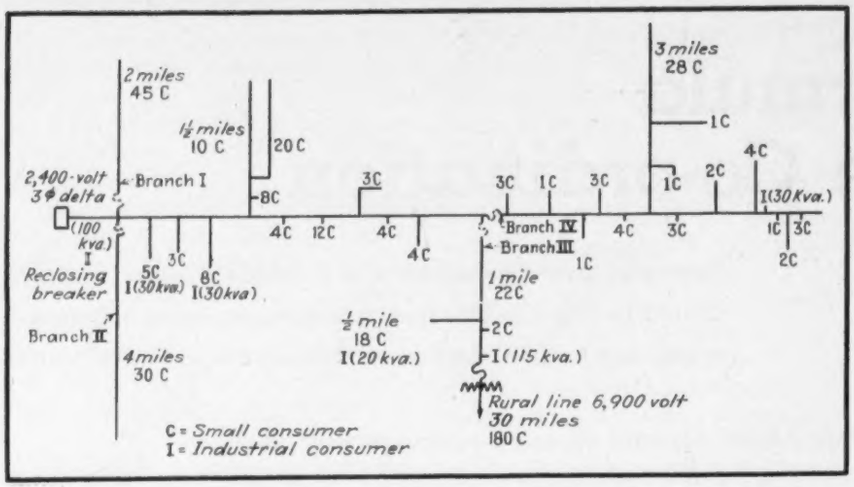


FIG. 2—Analysis of actual feeder shows that fuses can be justified for certain branches, but not for the rest

For example, refer to Fig. 2, which shows an actual feeder map from which have been chosen several branch taps to illustrate the results obtained by the ABC method.

Data and Assumptions

Main feeder.....	4 miles long
Total consumers.	441
Speed of travel..	30 m.p.h. (always starting from the origin of the feeder)
Time to climb pole.	5 minutes
Time to communicate with substation.....	Urban — 5 minutes Rural — 15 minutes

Number of temporary and permanent faults for the various branches, as shown in the tabulation that follows.

The number of temporary and permanent faults used in the example are higher than will be found in actual service. This is because whole numbers were selected, which would provide a representative ratio of temporary to permanent faults and avoid the use of fractions.

In calculating this feeder the ABC analysis was applied to each branch in order, starting at the origin of the feeder. Each branch is considered as fused in calculating branches beyond it, where single-element cutouts are shown to be advantageous by the above formula. The time for a trouble crew to locate a faulty branch with no fuse was based on the assumption that the trouble crew could locate the fault more quickly by checking the unfused branches in order, rather than by following a normal routine of going to some particular point on the feeder to make the first check.

Using the above assumptions, the following results were obtained:

Branch I	Branch II
a = 3	a = 7
b = 10 min.	b = 10
c = 45	c = 30
A = 1	A = 2
B = 15 min.	B = 15
C = 396	C = 411
abc = 1,350	abc = 2,100
ABC = 5,940	ABC = 12,330
abc < ABC	abc < ABC
Use fuse at Branch I	Use fuse at Branch II

Branch III	Branch IV
a = 4	a = 8
b = 15	b = 15
c = 224	c = 58
A = 1	A = 3
B = 20	B = 20
C = 217	C = 383
abc = 13,440	abc = 6,960
ABC = 4,340	ABC = 22,980
abc > ABC	abc < ABC
Do *not* fuse Branch III	Use fuse at Branch IV

These figures show that there is a benefit or saving in CMO by fusing points I, II and IV. The greater ABC is over abc, the greater will be the benefit from fusing. For example, on Branch II and IV there is a great reduction of CMO to be gained by fusing these branches. In the case of Branch I, there is still a substantial benefit, but it is not as great as for Branches II and IV.

The figures for Branch III show that there will be more CMO with a single-element fuse than with no fuse. The temporary and permanent faults given above for Branch III occur in the section between the main feeder and the step-up rural transformer. Faults on the fused rural line do not affect the calculations in determining whether the branch should or should not be fused. However, this is where the use of a reclosing fuse or oil circuit recloser might be shown to be advantageous by the ABC method of analysis.

Reclosing Station Breaker and Reclosing Line Fuses—Multi-element fusing will reduce the number of temporary faults that will cause an outage. This reduction will depend upon the ability of the device to clear temporary faults with only a negligible momentary outage. Thus (a) should be multiplied by a value *K* taken from Table I to give the number of temporary faults that cause an outage. The formula then becomes:

$$Kabc \gtrless ABC$$

Table I

Type of protection	K
Single-shot fuse cutout.....	1.00
Two-shot fuse cutout.....	0.45
Three-shot fuse cutout.....	0.30
Overlapping protection	
with: 1 element fuse.....	0.23
2 element fuse.....	0.13
3 element fuse.....	0.08

Note — The above values were developed on the assumption that the circuit was not patrolled.

Non-Reclosing Station Breaker and Single-Element Fuses—If there is a non-reclosing breaker at the substation, then temporary faults on Branch X also will open the breaker if Branch X is unfused. Therefore, there will be an additional CMO caused by these temporary faults equal to ab′C where b′ is the time to close the station breaker. Thus ABC + ab′C is the total CMO for the consumers on the feeder exclusive of Branch X, resulting from permanent and temporary faults on unfused Branch X and the formula becomes:

$$abc \gtrless ABC + ab'C$$

Non-Reclosing Station Breaker and Reclosing Line Fuses—As in the paragraph entitled "Reclosing Station Breaker and Reclosing Line Fuses" a multiplier, *K*, must be used and the formula for this condition is:

$$Kabc \gtrless ABC + ab'C$$

Reclosing Station Breaker Providing Overlapping Protection—Reclosing breakers can be equipped with instantaneous attachment to open ahead of line equipment on first opening but with time delay before second opening to permit line equipment to isolate faults. This arrangement, which we will term overlapping protection, is equivalent to adding one

automatic resetting reclosure to that of the actual line equipment. Thus obtain the correct value for *K* from Table I and apply formula:

$$Kabc \gtrless ABC$$

Line Sectionalizing Points—The ABC method can also be used to select line sectionalizing points. In this case that part of the feeder beyond the sectionalizing point is considered as Branch X, and that part of the feeder from the substation to the proposed sectionalizing point is considered as the feeder exclusive of Branch X. Otherwise the calculations and procedure are identical to that used for a branch.

Branch X Beyond Line Sectionalizing Point—Having located the sectionalizing point the following procedure should be followed in applying the ABC method to the feeder beyond this point. Permanent faults on this portion of the feeder will open the sectionalizing protective device and cause a permanent outage to the consumers beyond the point, instead of having the station breaker lock out the entire feeder. Thus, C in the formula is the number of consumers *beyond* this sectionalizing point, excluding those on Branch X.

If an automatic resetting recloser is used at the sectionalizing point, then temporary faults beyond this recloser will be cleared in the same manner as with a reclosing station breaker. Thus apply formulas:

$$abc \gtrless ABC, \text{ for single-element cutouts}$$

$$Kabc \gtrless ABC, \text{ for multi-element cutouts}$$

If a single-element fuse is used at the sectionalizing point, then temporary faults on Branch X also will blow the sectionalizing fuse if Branch X is unfused. Therefore, there will be an additional CMO of ab′C caused by these temporary faults just as with the non-reclosing station breaker. Thus apply formulas:

$$abc \gtrless ABC + ab'C, \text{ for single-element cutouts}$$

$$Kabc \gtrless ABC + ab'C, \text{ for multi-element cutouts}$$

If a reclosing fuse is used at the sectionalizing point or overlapping station breaker protection is provided, then the ab′C portion of the formula just discussed for the single-element fuse should be Kab′C. The value for K can be determined from Table I for the type of reclosing fuse employed at the sectionalizing point.

Electrolytic Treatment Averts Pile Infestation

Wood piles and anchor posts impregnated with copper by electrolytic process to depth of ¾ in.—Treated wood in salt water for seventeen years found free from infestation

A NEW electrolytic process for the treatment of wood to protect it against infestations by the teredo and other marine borers, termites and boring insects and worms generally has been developed by the Olympia Wood Preserving Company of Olympia, Wash. By "new" is meant new on a commercial basis. H. S. Andrews, president of the company, patented the process in 1925 and has been working on it in an experimental way since then. But it was only in September, 1941, that production on a commercial scale got under way.

The major portion of the output is now in the form of treated piles, used principally by the Navy. However, some progress has been made in the direction of treating prefabricated lumber, railroad ties, etc., with a view also to the needs of electrical utilities for such items as pole stubs, anchor posts etc., of small sizes. Butt treatment of poles is apparently not so practicable because the process embodies immersion of the whole pole in the electrolyte. This involves treatment, partially at least, of the whole length of the pole, which would be to an extent uneconomical since the butt is the only portion primarily requiring it.

Steps in Process

Piles from 60 to 120 ft. in length are now being treated. The pile is rough peeled in the yard and then smoothed by means of an electrically operated steel brush (Fig. 1).

Next operation requires three men working in close harmony (see Fig. 2). The first man, walking at a slow pace, cuts a slot three-quarters of an inch in depth in the surface of the pile with a power saw taking current from an overhead trolley. The man next to him feeds a 16-gage bare copper wire into the slot and sets it in place at the bottom with a little hand wheel which follows the slot. The third man drives staples at intervals astride the slot to hold the wire in place.

The slots, which are about 8 in.

FIG. 1—Wire brushing the surface of a pile in the pretreating process

FIG. 2 Teamwork in the pretreating shed—Slotting with a saw, laying in the wire and stapling; this proceeds at the pace of a slow walk

FIG. 3—Placing pile in one of the six electrolytic tanks

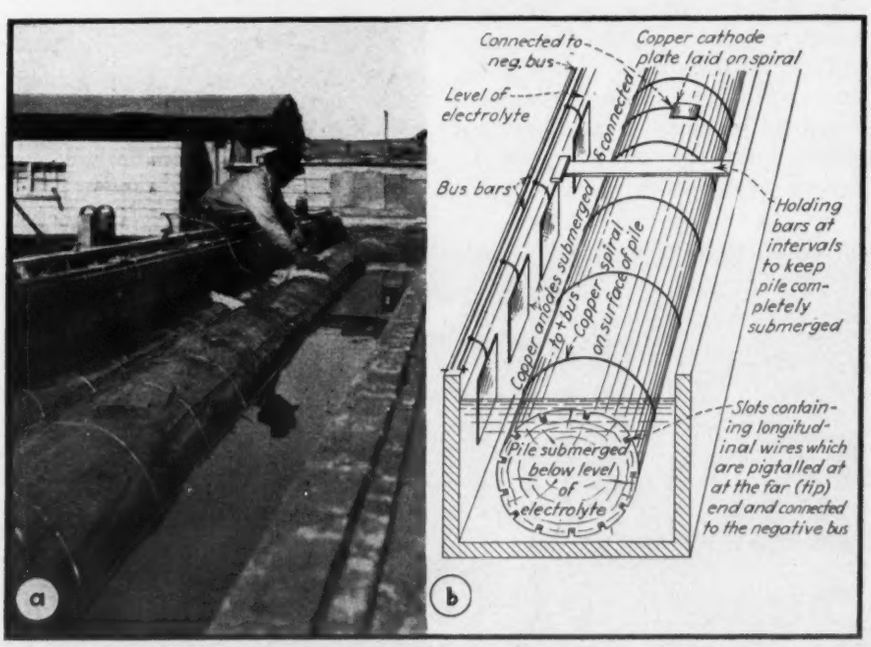

Connected to neg. bus
Copper cathode plate laid on spiral
Level of electrolyte
6 connected
Bus bars
Holding bars at intervals to keep pile completely submerged
Copper anodes submerged
to + bus
Copper spiral on surface of pile
Slots containing longitudinal wires which are pigtailed at at the far (tip) end and connected to the negative bus
Pile submerged below level of electrolyte
a
b

FIG. 4—(a) Close-up of one of the tanks just before the pile is completely submerged; placing a cathode plate on one of the wire spirals. Anodes for the cell are hung below the surface of the electrolyte along the left side, where the buses are located; (b) schematic drawing of tank and pile

apart, are run to about 10 ft. from the butt end, which is about the cut-off point after driving. At the tip end of the pile they are run to the point where the pile will be submerged in the mud or sand under the water. The longitudinal wires in the slots are all brought out at the tip end and pigtailed together.

Next step is to paint all that portion of the pile which will be in contact with the water with a coating of metal graphite paint. Over this painted surface is wound a spiral of 10-gage bare copper wire, about 14 in. between turns and stapled in place.

Electrolytic Process

The pile is then lifted by crane from the pretreating shed and placed in one of the electrolytic tanks, as shown in Fig. 3. There are six of these tanks, ranging in length from 130 ft. down to 85 ft. Each is approximately 4 ft. across by 3 ft. deep and contains the electrolyte solution.

The solution in the tank consists of copper sulphate, sulphuric acid and water and other elements. Along one edge of the tank are the positive and negative copper buses. The copper anodes are suspended in the solution along that side of the tank and connected with the positive bus. The pigtail containing the ends of all the embedded longitudinal wires is connected to the negative bus. In addition, cathode plates of copper are laid on the copper spiral at intervals of 10 ft. and connected to the negative bus. See Fig. 4.

Generally speaking, an ionization process of impregnation by copper sulphate takes place. In the present process permanent impregnation is obtained by the electrolytic action to a depth of $\frac{3}{4}$ in. over the entire surface. This action is further augmented by several contributing factors: (1) Heat generated by the formation of napthalene, (2) capillary attraction, (3) softening but not burning of the fibre by the acid solution, (4) osmotic pressure.

Not only is a shell of wood so impregnated with the copper sulphate, but a certain amount of metallic copper, in microscopic particles, permeates the fibre structure of the shell, and it also appears as a copper-colored sheen over the surface.

The longitudinal copper wires are left in the slots when the pile is in

use, and then another important action takes place. Salt water is an electrolyte and further decomposition of the sulphate to metallic copper takes place and strikes deeper and deeper into the pile. In case of piles so treated, after being in salt water for 17 years, it was found that copper had penetrated clear to the core, and they were found to be sound and free from infestation.

The point of toxicity of copper for marine life is 0.06, and it is said that this process produces frequently 21 times that amount. All piles that are turned out contain not less than an average of three ounces of metallic copper to the cubic foot, to a depth of three-quarters of an inch. This is checked by laboratory tests on a predetermined number of piles in each order. This will figure something like eight pounds of metallic copper to the average 60-ft. pile. Piles that have been in salt water for a period of nine months, after some sulphate had been decomposed, showed as high as seven ounces of copper per cubic foot of ¾-in. outer shell.

The process appears also to harden the wood and to eliminate fire hazard. Wood so treated will not burn, but will merely char. This will be an important factor in the use of impregnated wood for fabrication purposes.

Power Requirements

Electric current requirements for the operation of the electrolytic tanks is rather high. For the six tanks three motor-generator sets are required—one of 5,000 amp., one of 3,000 and one of 2,500. The treatment requires from 6 to 16 amp. per square foot of surface treated, at not to exceed 10 volts. Ammeter, voltmeter and rheostat are installed for each tank, with rheostatic control at a central point.

The process being unique, no specifications had been set up as to depth of impregnation, amount of copper per cubic foot, etc., so the company has more or less set up its own standards, with ample margin of safety to insure lasting results.

Frequent sampling is done in the case of each order. One-inch holes 1 in. deep are bored in the selected piles and the borings divided into two samples, each representing ½ in. in depth. These borings are then reduced to ash and the amount of copper cubic foot ascertained by the titration method.

Wiring Economies Under Wartime Code

Higher temperature capabilities of wires insulated with oil base rubber compounds can be utilized to improve quality of permanent installations and to make savings in temporary work

L. C. PETERMAN, Ford, Bacon & Davis, Inc., New York*

FOR war production projects and priority-rated industrial plants use of rubber insulated wire has recently quite generally been limited to type R and then only for moist locations. For very severe moisture conditions the W.P.B. type WB, which contains more rubber than type R, is permitted. An important point is here being overlooked, namely, that type R is not moistureproof, also that merely increasing the amount of rubber in the insulating compound does not make it moistureproof, although it may make some improvement.

For moistureproof cable insulation the logical approach is to use either paper or cambric insulation with lead covering or to use a rubber insulation especially compounded for moisture-resistant properties. For many industrial installations lead-covered cables are costly to install and present special maintenance problems which make them less desirable than the rubber-insulated wires and cables.

One type of rubber compound insulation which fits admirably into the present-day picture is the so-called "oil base" compound. This has all the good qualities of the type RW wire of the late-lamented 1940 Code plus some additional excellent properties. Wires insulated with this material are adaptable to a greater variety of applications around industrial plants than perhaps any other, for these reasons:

1. The insulation contains only slightly more rubber than Code wire and can be used in all applications where the WPB "WB" wire is permitted.

2. It is moisture resistant, permitting underground or underfloor installation (similar in this respect to "RW" wire).

3. It can be operated at a temperature level which compares favorably with cambric and paper insulations (about the same as "RH" wire).

4. The higher permissible operating temperature as compared to Code wire actually makes it cheaper than the latter, and permits large savings in copper and conduit steel in those cases where the installation is made on a sound engineering basis.

5. For voltages 2,300 to 5,000 and even higher it has great flexibility in application and great ease of installation. Terminals can be made without potheads. It resists corona cutting and sun cracking. Overhead connections to an underground system can be made without splicing.

Temperature Rating

One shortcoming of the National Electrical Code is failure to recognize that properties of type RW and type RH can be combined in one insulation. Probably all companies manufacturing oil base insulation can secure, if desired, an RW rating for their product, but the Code rates RW insulation as suitable for maximum operating conductor temperature of 50 deg. only. Always slow to recognize technical advances, the Code gives an elevated temperature rating of over 50 deg. C. only to those compounds which are rich in rubber (RP and RH). Oil base insulation is a "rubber poor" compound.

The interim changes in the 1940 Code which restore the 1937 current

*Electrical Engineer.

Costs* and Weights of Three Wires in Conduit, per Foot

Nominal Rating of Circuit, Amperes	Code Wire					Oil Base Compound Wire					Percent Savings Oil Base Compound over Code Wire		
	Wire Size	Conduit Size (In.)	Cost (Dollars)	Weights (lb.)		Wire Size	Conduit Size (In.)	Cost (Dollars)	Weight (lb.)				
				Copper	Steel				Copper	Steel	Cost	Copper	Steel
100	No. 1/0	2	1.38	9.76	3.68	No. 3	1¼	1.05	4.89	2.28	24	50	38
150	No. 4/0	2½	2.00	19.6	5.82	No. 1/0	2	1.63	9.76	3.68	18	50	37
225	400,000 circ. mil.	3	2.73	37.2	7.62	No. 4/0	2½	2.31	19.6	5.82	15	47	24

* Costs are based on actual purchases of material, plus labor of installation under recent contracts.

ratings for wire for the duration of the emergency give type R as high a rating as type RH (for the average sizes) and in effect make no distinction between the various types of insulating compounds. On the basis of the intensive research carried on between 1937 and 1940 we have ample reason for believing that the 1937 current ratings for type R which are now being used will result in short-lived insulation.

After the Emergency

By purchasing and operating wire with oil base insulation at the ratings allowed by the interim changes in the Code for type R we are afforded a means of securing a high-grade installation under wartime conditions while obviating the deterioration which will undoubtedly occur if type R is used at the elevated operating temperatures now permitted.

When the present emergency is over we may return to the ratings of the 1940 Code, although the synthetic rubbers may alter the picture. A comparison based on the soundly conceived ratings of the 1940 Code for Code wire and on the higher temperature capability of wire with oil base compound insulation indicates the advantages of the latter in savings in costs and in weights of copper and steel, as shown in the accompanying table. These advantages will accrue for temporary jobs not subject to code inspection if the rating of the higher temperature wire is increased over the rating of type R in proportion to the sound permissible operating temperatures of the respective insulations.

If a job must adhere to all provisions of the Code, without recognition of the superior qualities of the oil base compound insulation, no savings are possible. However, if the engineer can take advantage of the well-established and tested qualities of the oil base compound, without being bound by the hampering restrictions of the Code (as is fortunately the case in many large installations), he has two courses open:

(a) For the permanent installation, use oil base insulation and operate at 1937 Code ratings, resulting in no saving in copper, rubber or steel, as compared to type R, but with the corollary advantages earlier stated.

(b) For the temporary installation, use oil base insulation and operate at a current rating which produces at least as high a temperature rise over the sound operating temperature as is produced by operating type R at 1937 Code ratings. This will result in savings of the order of those given in the table.

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War Stamps for Old Appliances

G. W. OUSLER
Vice-President, Duquesne Light Company

"Swap Old Appliances for War Stamps" is the slogan of a dealer co-operation plan recently put into operation by Duquesne Light. The plan is that originated by the Proctor Electric Company and offered to the industry under the title "Appliance Restoration Plan." Sales helps including window streamers, identification stickers, hand-bills were welcomed by dealers whose stores and windows looked pretty bare without the posters and other selling aids formerly supplied by manufacturers. The utility also set up an advertising schedule including newspaper space, radio, street car cards, billboards and copy on electric service bills.

The plan was not ballyhoo'ed to the dealers, no dinner meeting announcements or anything of that kind. Instead, the six Duquesne dealer representatives talked it over personally with each of the 272 dealers in the territory. Of these 220 accepted it enthusiastically. Those who turned it down were mostly department, hardware and other stores without appliance repair facilities.

Without question the plan has attained its first objective. It has convinced the dealers that Duquesne Light sincerely wants them to stay in business and is willing to help them do so. The plan is extremely simple. Dealers offer to give war stamps for old appliances. The dealer then reconditions such of the appliances as are worth it and he uses the others as a source of repair parts. It gives the dealer a certain amount of merchandise to sell and builds up his stock of parts for use in his repair business.

BEFORE it was half set up, this window display brought customers into the store

The plan was taken to the dealers late in April and first announcement to the public was on May 4. At the time of writing this story it was too early to have accumulated any overall figures on results. But one dealer has already reported that in the first week of operation he had swapped stamps for 35 electric sweepers, 14 flat irons and one refrigerator. And of the 35 sweepers about 20 can be restored to working condition.

Regimentation of Science

Through the creation of a two-hundred-million-dollar bureaucracy, Kilgore bill offers a totalitarian measure menacing to war effort and inhibitory to transition to peacetime economy

L. A. HAWKINS, Executive Engineer, General Electric Research Laboratory

EVERY good citizen, who understands, even in part, the extent to which modern war is mechanized and the dependence of effective mechanization on the successful application of science and technology, is keenly desirous that all the scientific and technological brain power of the nation shall be utilized to the full to insure and to hasten victory. Every good citizen also desires that, when victory is won, that same brain power shall be most effectively applied to the quick and efficient transition to peacetime economy and to the resumption of the elevation of living standards through the production of new and better and more goods at lower cost.

Preamble Looks Good

Consequently every good citizen must enthusiastically indorse the preamble of the Kilgore bill (S. 702), which sets forth the foregoing objectives, and must be favorably predisposed thereby to the provisions of the bill itself. Further, since many of the specific matters dealt with lie outside the experience and intimate knowledge of most men, the average good citizen is likely to take on faith the merits of the bill's provisions, assuming that legislation aimed at such worthy objectives must be meritorious.

Unfortunately, good intentions are not enough. They must be wisely implemented if they are to succeed. Zeal without knowledge is more dangerous than intentional evil, for it may gain far wider support, giving it far greater potentiality for destruction.

Let us take an example. All good citizens are keenly desirous that the war constantly waged by medicine and surgery, with steadily increasing success, against sickness and suffering and premature death, should receive all possible aid to its effectiveness. But suppose it were proposed by a zealous humanitarian that the work of the medical profession be promoted by the following measures:

(1) All physicians, surgeons, and nurses and hospital orderlies with six months experience, to be made subject to a supreme board on which the medical profession would have a small minority representation, consisting possibly of a nurse and an orderly. (2) That board to have power to prescribe rules, regulations, procedures and methods for training for medical practice; to fix the qualifications for practice; to determine whether the individual doctor shall engage in private practice or work in a medical institution, and to control all conditions of employment. (3) That board to have power to make, amend or rescind its rules at any time, those rules to have the effect of law. (4) That board to have power, if in its judgment it becomes necessary, to requisition the medical or surgical instruments and other facilities of doctor or hospital and to distribute them to others. (5) That board to have power, by assigning a nurse or other assistant, at its own expense, to a doctor, to acquire full rights to his practice and to admit others to share in it.

Disorganizing and Debilitating

Most men have had sufficiently close contact with physicians and their beneficent ministrations to perceive at once that such revolutionary totalitarian regimentation of the training and activities of the medical profession, rather than being helpful, would be disorganizing and debilitating.

Perhaps that is the reason why physicians and dentists are expressly excluded from the scope of the Kilgore bill, although it includes astronomers, geologists, archeologists, biologists and other scientists, whose activities are more remote from the purpose of the bill than are those physicians and dentists who do directly contribute to the maintenance of the manpower of industry.

Public Not Close to Science

The menace of the bill lies in the relative lack of knowledge by the general public of the aims, methods and results of science and technology in war and in industry. To the average man, the physician, who comes to his bedside to relieve pain or allay a fever, is close and his aims and methods understandable, while the physicist in his laboratory, developing new principles for improving radar for war use or for safe flying and navigation in peacetime, is remote and relatively mysterious. Consequently the average man may fail at first glance to see that what would be injurious to the practice of medicine would be equally injurious to industrial research. It is urgent that he should realize this limitation to his vision and should give heed when those who live close to industrial research assure him that it, too, would suffer from totalitarian regimentation. He may then curb his enthusiasm for the Kilgore bill's preamble and, with unprejudiced mind, consider the

bill's provisions and their probable effect.

Those provisions are substantially the same as those listed in the hypothetical proposal for the regimentation of medicine, and to them are subject all college graduates (except physicians and dentists) in science or engineering and all persons with "six months training or employment in any scientific or technical vocation"—probably well over a million people.

Regulation by Non-Scientists

This army of scientists, engineers and technicians is to be commanded by a board on which it is to be allowed only two representatives out of seven, and those two may possibly be "technologists" with "six months employment in a technical vocation" as their sole qualification. This possibility is of course unintended, and can easily be corrected, but is cited to show the looseness with which the bill is drawn. That there is only a small minority representation of science on the board, however, stamps the board, not as scientific, but as political. It is much as if the present General Staff of the Army were to be replaced by a board on which those with military training were outnumbered more than two to one by civilians unversed in military affairs.

Political Advisory Committee

To make matters worse, and to minimize further the influence of the nation's scientists or technologists in the proposed totalitarian control of the nation's scientific and technologic activities, there is to be an advisory committee, on which the scientists or technologists are to be outnumbered more than five to one by political appointees.

A 200-Million Club

This non-scientific board, advised by this non-scientific committee, is to be endowed with the sum of $200,000,000, with which they may organize new corporations or buy up existing corporations, or which may be otherwise used at the discretion of the administrator, the chairman of the board, in furtherance of the objects of the bill. Obviously this places at the mercy of the administrator any private industrial corporation based on scientific and engineering developments for, if the administrator should choose to take over its business, no private company could withstand the governmental competition, so generously financed, which could be brought against it, and would be forced to sell out on the administrator's terms.

This non-scientific board is to have power to formulate scientific programs, both for war and for peace, and, for the duration of the war, to prescribe autocratically the personnel and facilities for those programs, and to divert at will to its own pet projects men and facilities from all other war projects, whatever their status and their importance in the eyes of the military and of scientists themselves.

Now Work With Military

It would be hard to conceive a greater injury to the scientific part of the war effort than is potential in the Kilgore bill. The National Defense Research Committee and its outgrowth, the Office of Scientific Research and Development, both staffed by some of the nation's ablest scientists, have effectively mobilized the nation's scientific brains, drawing them as needed from university and industrial laboratories, and co-ordinating their work with the nation's military needs as presented by experts of Army and Navy. Every line of attack which has merit in the eyes of the military or of the scientists themselves is now adequately staffed with able experts, and, if it were possible to publish the results, the public would be well satisfied with what is being accomplished. Just as American industry has far outstripped that of Germany, despite the latter's long head-start in war production, so American science has overtaken and is surpassing German science in the arts of war. All this organization, the fruit of three years of intensive and able effort, would be imperiled by the Kilgore bill.

Inventors' Council

The inventors, who offer themselves as proof that the nation's brains are not being utilized, have had opportunity to submit their inventions to a thoroughly competent and unbiassed tribunal—the National Inventors Council. The membership of that council is composed of distinguished scientists and military experts, assisted by large groups of able specialists. Every suggestion sent to the council is carefully considered, and the verdict on its merits is as authoritative as could possibly be obtained. To appeal from such a body to an unscientific and non-military committee is to attempt to accomplish by clamor what cannot be achieved by merit.

It is unfortunately true that secrecy limitations may prevent the council from informing the author of a meritorious invention about such use as may be made of it, or about its anticipation by others, or about a still more meritorious device which prevents its utilization, but patriotism and good sense should deter any inventor who knows the personnel and procedure of the council from loudly appealing from its judgment to a body obviously unqualified to pass on the scientific and military aspects of the case.

Post-War Blight

Since the nation's all-important task is to bring this war to the earliest and most victorious conclusion, the injurious effect the Kilgore bill would have on the war effort is the most cogent and urgent reason for condemning it. However, the powers created by the Kilgore bill are not limited to war, but extend indefinitely into peacetimes, and when victory comes we shall be confronted with the task of beating swords into plowshears on a scale more gigantic than any nation has before faced. Not only must we convert, as nearly overnight as may be, the world's hugest war machine to the products of peace, but its operation must be speeded far beyond the pace of pre-war years, not only to satisfy the accumulated civilian needs, perforce neglected during the war, but to supply help in rehabilitating a war-wrecked world, to enable the devastated nations to rebuild their economy speedily enough to avert widespread starvation and anarchy, which again would endanger the peace of the world and make impossible the implementation of the Atlantic Charter.

Much of the burden of this huge task will rest on science and technology, but their peacetime activities would be blighted by the Kilgore bill

as surely, if not, perhaps, as immediately, as their war efforts. For the purpose of making the discoveries and data of scientific institutions and research laboratories "more readily available," particularly "to smaller business," the board is empowered to subpœna witnesses and requisition records under penalty of fine and imprisonment.

Taxation of Brains

Here we have an extraordinary extension of the philosophy that every individual unable or unwilling to support himself and his probably abnormally large flock of offspring is entitled to support by the industrious and thrifty majority. Humanitarian instincts support this philosophy, but wisdom cautions that the transfer from the "haves" to the "have nots" should not be so great as to overburden individuals and industry alike and transform us all into a nation of "have nots," nor even to cripple the enterprise which has so successfully raised the national living standards to unprecedented heights.

But now the Kilgore bill proposes a new medium of taxation and charity, a medium which is not money, but brains. It is not enough, it seems, that the pocketbooks of the industrious and thrifty should be picked to support incompetent and idle individuals, but their brains are to be rifled to support the inefficient industries. It might be supposed that by patenting his inventions a scientist or engineer might save for himself and his employer a portion of the fruits of his work, but the Kilgore bill provides a check-mate for that move. "Any provision of law to the contrary notwithstanding," the board acquires the exclusive rights to any invention or patent resulting from work to which any governmental agency contributes "any money, credit, physical facilities or personnel." It would seem simple, in view of the stated object of the bill, to make such developments free to all, and in view of the powers delegated to it, for the board, on learning, through the enforced disclosure the bill provides, of a research project of evident value, to inject into it some form of "contribution" which, under the bill, would enable it to seize all patent rights.

Any sociologist will agree that, instead of supporting the poor by charity or government subsidy, it is far better to help the poor to support themselves, and if this is true of financial aid, it would seem doubly and trebly true of aid in research. Far better, than attempting to impose on scientific brains a totalitarian communistic regime inimical to scientific progress, would it be to help the small and struggling companies, too poor to finance research laboratories of their own, to obtain the research service they need by combining resources with other similar companies to support research from which they would all profit. Just such help is available, and has been available for a quarter of a century, in the National Research Council, which has shown groups of small companies in a number of industries how to organize jointly supported and jointly profitable research, either in a laboratory instituted for the purpose or by utilizing the facilities of such service institutions as the Mellon Institute or of the science departments of technological universities.

Would Harass Industry

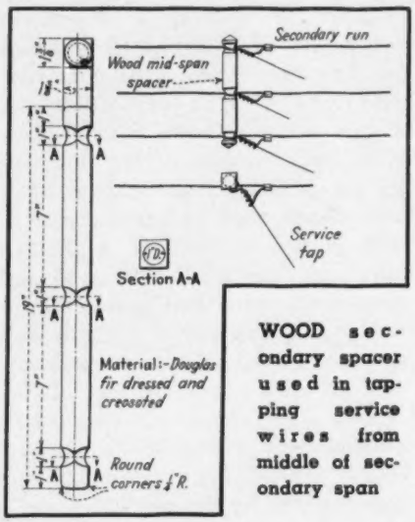
Apparently the draftees of the Kilgore bill were uninformed of these activities of the National Research Council, while their knowledge of the war work of NDRC, OSRD and NIC seems to have been drawn from people largely ignorant of the efficiency of those organizations and the magnitude of their contributions to the war effort. Apparently in such ignorance, and certainly in express disregard, of these existing excellent agencies, the Kilgore bill would create a huge new bureau, with power to supersede them and wreck their war programs, and, not only in war, but in peace as well, to harass industry by prying into and confiscating new developments, and to subject scientists and engineers to an extreme totalitarian regimentation.

Wholly laudable in its aims, but badly mistaken in its premises, the Kilgore bill offers the nation a totalitarian measure, menacing to the war effort, inhibiting to the transition to peacetime economy, and demanding for its implementation the addition of a huge brigade to the army of federal office holders and for its commanding officers scientific omniscience and technological omnipotence.

Use Wood Spacer for Mid-Span Service Taps

For making "flying" service taps in the middle of secondary spans Wisconsin Electric Power Company, Milwaukee, uses a mid-span spacer made from the sound wood of crossarms that have been retired from service.

Spacer design is a modification of wooden secondary racks (ELECTRICAL WORLD, November 28, 1942, page 88) also developed to conserve steel. Spacers are approximately $1\frac{3}{8}$ in. square in section, with 1-in. grooves turned at both ends and in the middle to accommodate the secondary



WOOD secondary spacer used in tapping service wires from middle of secondary span

conductors. They are given a bath in hot creosote after being turned out on a wood lathe.

Accompanying sketch shows the method used to make the flying tap. The spacer is first taped to the secondary conductors at the point where the tap is to be made. The spacer is placed on the opposite side of the secondary wires from the direction of take-off of the service drop so that the tension of the service wires will hold the spacer against the secondary conductors.

By cinching the end of each service conductor tightly the secondary wire is held securely in the groove of the spacer.

Only one spacer is used in a secondary span, but occasionally when small (No. 6) services are run a second service may be taken from the opposite side of the spacer in order to balance the tension of the first service wires.

Disconnect Inching Averts Accidents and Outages

Controversial procedure resolved on ten years' trial in favor of intelligent inching rather than quick, wide opening or uncertain hesitant action

EDMUND R. PAIGE, Buffalo Niagara & Eastern Power Corporation*

ALTHOUGH the so-called "inching method" of opening a disconnect switch was adopted only a year ago for the entire system of Buffalo Niagara and Eastern Power Corporation, it has actually been practiced by some large sections of the company for ten or more years with satisfactory results, that is, interruptions to service and damage to equipment have been prevented. During the last year there were two successful instances. In one case a ground fault or phase-to-phase fault was probably avoided when a stick-operated disconnecting switch blade was quickly reclosed, thus extinguishing the arc which formed when the switch had been opened by the smallest possible amount. In the other case a loaded feeder did not suffer an interruption, fortunately, because its outdoor gang-operated disconnecting switch was quickly reclosed after the switch had been inched to the point where the blades and clips had just parted.

Advantages and Disadvantages

The advantages and disadvantages with which the inching method has been credited are:

Advantages

1. When through error the wrong switch is opened, it:
   (a) avoids severe burns to the operator's body and eyes.
   (b) avoids interrupting service on the particular circuit, because the arc is not broken.
   (c) avoids widespread interruption to service, because it avoids flashes to ground, etc.

Disadvantages

1. Contended by some persons that it will cause operators to be less careful in their check of the operating conditions prior to the actual switching.
2. Requires the operator to look directly at the point of break.
3. Contended by some that with gang-operated switches, load current is often broken, producing copper vapor; therefore, any opening slower than a very fast one would hinder extinction of the arc.

Our company knows, through experience, that the advantages far outweigh the disadvantages.

Rules for Operators

The inching method is defined by the following rules given to electrical operators of substation or stations:

Never open or close a disconnecting switch until you have thoughtly checked your circuit and operating conditions. However, as an additional precaution, to act as a back-up protection against dangerous arcs and interruptions to service, operate disconnecting switches on the following general principles or rules:

1. When *opening* a disconnecting switch, open it by inching or gradually pulling until the blade and clip have parted by the smallest possible amount. If *no* arc develops, the switch may be fully opened. If a *small* arc occurs, which is no greater than you expected, continue to

FIG. 1. Supervisor instructs operator on inching of demonstration disconnect in fixed location. Arc obtained by short circuiting two street-lighting transformers whose secondaries are in series

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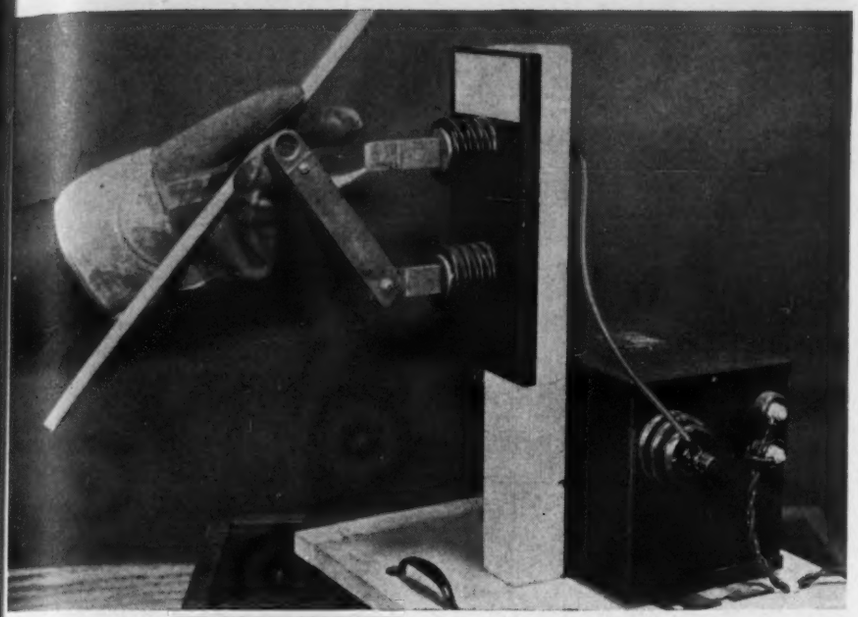

FIG. 2. Portable energized demonstration model. Miniature disconnecting switch short circuits 12 kv. 30 ma. secondary of neon sign transformer. Note operator wears rubber gloves because 30 ma. is hazardous to life

open slowly, keeping your balance such that you can slam the switch closed if the arc develops into one that is greater than you expected. If a *large* arc occurs, which is obviously greater than you expect, slam the switch closed and report the matter to your supervisor.

(a) Opening in this way is called the inching method.

(b) The virtue of the inching method is that it confines an arc, which on further opening of the switch would become unmanageable, to the particular switch that is being opened. That is, the arc is short in length; and there is less chance that the arc will flash to ground or another phase; it is the ensuing fault that causes damage.

(c) In some minds there is the fear that the inching method will burn the blades and clips in those cases where current is intentionally broken at disconnecting switches. But the inching method does not say that disconnecting switches should be opened very slowly. The method strikes the happy medium between a very slow opening, which results in burning, and a violent opening, which, fortunately, reduces the burning but which, unfortunately. eliminates the possibility of the operator reversing his operation and reclosing the switch before the arc has lengthened to an unmanageable size if the switch is opened in error.

2. When closing a disconnecting switch, close it quickly, following on through to the completely closed or latched position.

(a) If a disconnecting switch does not latch when you are closing it, you will want to open it to try again. This opening should, of course, be done by the inching method.

Training the Operators

Training consists of two steps:

First—Each operator spends fifteen or twenty minutes alone with his supervisor practicing on an energized demonstration model such as shown in Fig. 1. During this time the supervisor also discusses the purpose and virtues of the inching method. The operator is encouraged to voice any objections that he may have to employing the method in his daily operations. Thus, the operator should leave this first step convinced that the method is to him a two-fold blessing: he avoids severe bodily burns, and he avoids the consequences which follow an interruption to service or damage to equipment should he open the wrong switch. The model of Fig. 1 consists of two 20-kva. street-lighting transformers with the primary (2,400 volts) of one in parallel with the other, and with the secondary of one in series with the other and the pair short-circuited through the practice disconnecting switch. The arc produced is very long, though it does finally break when the switch is wide open.

The operator is first encouraged to experiment, thereby convincing himself that regardless of how fast he opens the switch, the arc is not reduced in size, and that it is a vain hope should he ever in practice expect to break an arc by quick opening. Next, he practices opening in such a way, the inching method way, that the undesired arc is as small as possible, which arc is extinguished by a quick reclosure. After some minutes of practice he learns to open the switch carefully, but not to take an impractical amount of time. Rather, he learns to do the job in five or ten seconds. Incidentally, since so many operators under modern conditions have never seen an arc, the sight of this one from the two street-lighting transformers has a wholesome, salutary effect.

Second—Each operator returns to his own substation or station and practices there for a few minutes on any disconnecting switch which, of course, breaks no arc. In this way he gets the feel of applying the inching method to his own disconnecting switches. For operators in remote stations, a small, portable, energized model is used as shown in Fig. 2. This portable model can be carried in the supervisor's car, and the lesson can be given on one of his routine visits.

Questions About the Practice

Possible questions (with answers) on the inching method are:

QUESTION 1: In some districts linemen operate the outdoor disconnecting switches where load current is intentionally broken with a resulting heavy arc; they also operate indoor disconnecting switches where no current will be broken and, hence, no arc. With this in mind, should we expect linemen to distinguish between the two cases; otherwise he may inch out a loaded switch, get an arc, and then quickly reclose; whereas the switch could and should have been opened?

ANSWER: This question misses the central idea of the inching method. This method does *not* say that the switch should be reclosed if an arc occurs; it says that the switch should be opened in such a way that the operator is not off his balance and that he can reclose if the size of the arc indicates that an error in switching has been made.

QUESTION 2: Is this method as applicable to outdoor gang-operated disconnecting switch as to the indoor stick-operated type?

ANSWER: Yes; except in those cases where the design of the switch causes it to open with some violence.

QUESTION 3: If heavy arcing occurs, would it not be impossible to reclose the switch because of the beads of copper formed during the burning?

ANSWER: It would be possible to close at least part way; because the beads of copper would be molten until the arc was extinguished.

QUESTION 4: Is it possible to inch to point of break a switch that is very stiff and corroded?

ANSWER: Yes, with practice it is practically as easy as otherwise.

QUESTION 5: Are not arcs extinguished much more successfully by a very rapid opening than otherwise?

ANSWER: No. It is an opinion carried over from the past that an arc will be "drawn out" to a greater length if the switch is opened slowly.

QUESTION 6: Has this method ever been proven successfully by an actual experience?

ANSWER: Yes, currents of more than 1,000 amperes at high voltage have been successfully reclosed at the time of an error.

PRIORITIES PROBLEMS

Reporting Excess Withdrawals

Case No. 67

The Office of War Utilities has made a serious effort to keep the paper work required by its orders and forms to a minimum, for its own convenience as much as for that of the utilities. An example of OWU feeling in this matter is contained in its reply to a company which asked in detail how it should report its withdrawals from its own excess inventory to the regional inventory control office. In particular, the company asked how much of a change must be made in its excess stock of a given item before the new balance should be reported more often than quarterly.

The utility was told that it should report its withdrawals from its own excess inventory in accordance with existing regulations on reporting excess balance changes. This would call for a report at the end of each calendar quarterly period on all changed balances (by items, not by control classes), for a report on each sale from excess as it is transacted, and for a report at any time during a calendar quarter when a sale from excess so large as to impair the usefulness of the regional office's continuing inventory record is made.

As for a "spelled out" definition of when a sale is so large as to require immediate reporting on the basis that the old balance of that particular item of excess has been too drastically changed to be of further use, the Inventory Control Branch suggested that the company use a "common-sense" basis for making such a determination, or, if unable to decide for itself, to ask the regional WPB engineer.

Obviously, if a company lists as excess two transformers of identical size and type, then sells one of them shortly after a new calendar quarter opens, it has drastically changed its excess balance in that item. There is, however, little point in an immediate report of the changed balance. The seller in such a case should report the sale of one transformer of a given size and type and let it go at that.

On the other hand, if a company, having listed as excess 20,000 lb. of No. 6 copper conductor, sells 5,000 lb. of it, a report on the changed balance should, conceivably, be made, in addition to the report of the sale. This apparent discrepancy in reasoning is based on the fact that copper conductor records in the regional office are used more than excess transformer records, thus need to be more nearly up-to-the-minute if they are to be of any service. Furthermore, some line construction project may be about to be authorized on the basis that the necessary conductor is available in the excess stocks of Companies A, B and C. Any serious change in the status of these stocks may require reinspection of the project.

At the close of each calendar quarter there is no need to report all individual sales from excess over again. Instead, report changed balances of excess items. If the excess balance of a given item remains the same at the end of a given quarter as it stood at the close of the previous quarter, report the balance as unchanged. OWU officials point out that accuracy and promptness in making reports on excess inventory sales, depletions and balance changes are, if anything, more important to operating utilities than to the regional offices, inasmuch as the utilities are required, wherever feasible, to buy from excess stocks. The regional offices will not be so plagued by inaccurate continuing records as the utilities which are referred to specific companies as sources of needed material.

Cleaning Out Idle Stocks

Case No. 68

There is a feeling in the Office of War Utilities that critical materials should, for the duration, be applied to the uses at which they will do the most good, even if that means scrapping equipment which could, conceivably, be used.

This was demonstrated in the handling of a request made by a utility which asked for an increased inventory base so it could keep several old transformers which, while serviceable, would have been of appreciable value only to the company which owned them. Based on the idea that no metal should be idle unless it be of more use idle than it could otherwise be, the company was told that it ought to junk the old transformers unless it could make good use of them in inventory—without an increase in the inventory base. To retain the transformers in inventory under these conditions would have meant that the company would have been forced to switch into excess a corresponding number of newer transformers, which then would have been available to other companies.

The company was urged not to keep the old, barely usable transformers in excess inventory unless they were in sufficiently good condition that any operating company could have used them without question. Inasmuch as this was not the situation in the case at hand, OWU felt that it would be better to scrap the old transformers rather than let them sit, unpurchased and unused, in excess inventory. Had the petitioning company been allowed an increased inventory base to keep the

UTILITIES TROUBLED by the twin standards for allowable construction under Order U-1, namely, the limits of $500 on above-ground construction and $1,500 for underground construction, can decide for themselves which standard to use in cases where construction is both above and below ground. The method acceptable to OWU is to estimate whether the greater part is above or below ground and use the standard applying to that part which is greater. For example, if in a job estimated to cost $1,000, 60 percent is overhead and 40 percent underground, construction would not be permissible without specific authorization. If the majority of the cost on such job were underground, however, it would be permissible, since it would be below the $1,500 limit for underground construction. Jobs may not be split to complete either the underground or overhead portions of the construction.

RUTILITIES WHICH ARE ENGAGED in a rated construction job and have an unused allotment of controlled materials for it should report the unused portion of their allotment to the Office of War Utilities immediately so that the material available under the allotment may be allocated for use in the war effort. OWU points out that such unused allotments can be of no benefit to the companies holding them. They may not be purchased and put into inventory nor may they be applied to another construction job. Also, allotments expire at the close of the calendar quarter for which they were issued. In failing to notify OWU of an unused and unusable allotment, companies are merely allowing to slip away from immediate use in the war effort a portion of the limited amount of controlled materials made available to utilities through OWU. One of the commonest ways in which the situation arises is through purchase of a portion of the allotment from the excess stocks of another utility. The company, for instance, which is given an allotment of 10,000 pounds of copper conductor which may be ordered from a wire mill is required to attempt to purchase as much as possible of that conductor from excess stocks. If 5,000 pounds of conductor is purchased from excess, the company will finish the job with an unused allotment on the wire mill of 5,000 pounds. This portion of the allotment is frozen if it is not reported immediately to OWU for reallocation to another utility.

old transformers, it would have used its newer equipment first in making replacements, and the old units would merely have gathered dust in the warehouse until the end of the war or until things became so tight that they would have been forced to use anything available. In no case would the old transformers have done as much good as transformers as they could do as scrap.

Condenser Retubing

Case No. 69

Some wartime restrictions on use of materials result in improved operating efficiency which is doubly welcome in these days of conservation. One example of this is in the retubing of condensers, particularly certain older types which were designed with more tube surface than is actually needed.

One utility wrote OWU seeking authorization for a complete retubing job on an old-type condenser which was no longer capable of service at minimum service standards due to heavy tube failures. The company was referred to the manufacturer for a determination of whether the condenser was one which could be relaned in such a way as to do a more efficient job with only 70 to 80 percent of its originally specified tubing or whether it would require a complete job. This precaution, seemingly a time-waster on an important part of generating plant upkeep, is necessary because of the great demand for tubing for the various shipbuilding programs. In this case the company was told by the manufacturer that the condenser in question was susceptible to relaning and elimination of about 20 percent of its original tubes. It developed that the excess tube surface originally specified for the condenser cooled the steam injected into it below the point necessary for condensation, and fuel was wasted in reheating it to proper feedwater temperature.

Had an investigation shown that a complete retubing job was necessary, the authorization for such material expenditure would have been granted. In general, when notifying OWU of an engineering report on the possibilities of relaning, companies should submit the actual report which advises against relaning and eliminating tubes. The AA-1 rating which is automatically assigned by U-1 to maintenance and repair work is available for purchase of tubes, within the restriction on deliveries and withdrawals of the order.

In case the expenditure is of such proportions that it will exceed the limitations of paragraph (f), as will normally be the case, OWU will authorize the company to exceed these limits to the amount necessary to complete the allowed project. If the company has any unexpended dollar value for the given quarter in the generating equipment class, it will be expected to use this or submit substantiating information as to why it should not do so.

Scrap or Salvage?

Case No. 70

One of the questions to which the Office of War Utilities is unable to give an open and shut answer is whether a utility should continue to salvage equipment of which it already has a considerable excess stock.

The manpower question is one which will apply in every case and determine some of them. Obviously, if a utility is pinched for manpower, it is better from that company's point of view to scrap old equipment rather than to spend precious manhours adding to a supply already in excess. This phase of the problem is one which must be decided locally, by the company concerned.

There are, however, cases in which salvage of items of which a considerable excess supply exists is advisable. For one thing, the more usable equipment there is on hand, the less utilities will have to burden manufacturers to replace scrapped equipment. If salvage will reduce the demands on manufacturing facilities already overloaded, it will help win the war.

Then too, strictly from the point of view of the company, salvage will pay out in increased withdrawals. Under paragraph (f) (4) (v) of Order U-1, utilities may withdraw from inventory in any calendar quarter material in any class whose aggregate dollar value does not exceed in dollar value the usable material in the same class which they have salvaged during that quarter.

Thus, if a utility whose allowable quarterly withdrawals in the transmission and distribution class total $1,000 should salvage, during any quarter, $1,250 worth of transmission and distribution material, it would be eligible to withdraw from inventory during that quarter $1,250 worth of transmission and distribution equipment.

The problem of the basis on which to value salvaged material is one which OWU leaves up to the company performing the salvage. In general, it is regarded as fair to value such material on the same standards that the company has valued it in the past. Obviously abuse is possible under this reasoning. The feeling is, however, that if utilities are to be allowed to conduct their business free of unnecessary regulation and if they are to be allowed as much discretion as possible rather than be subjected to involved regulations covering every possible contingency, they must be trusted to perform such functions reasonably.

Editorials

S. B. WILLIAMS, *Editor*

Pennsylvania Recognizes Seed Money for Utilities

A RATHER unusual and foresighted action was taken week before last by the Pennsylvania Public Utility Commission in declaring a policy of "hands off" abnormal earnings during the war. In taking this action the commission recognized that while utilities were making more money than before for reasons beyond their control, they could not spend a normal amount on maintenance and rehabilitation. After the war these expenditures would have to be made and any rate cuts now reflecting artificial war earnings would mean increases after the war.

The commission makes it very clear, however, that this excess is not to find its way into materially higher dividends or increased salaries under penalty of a rate investigation. What it is, therefore, is a gentle reminder to the companies that the commission will expect deferred maintenance and rehabilitation to be undertaken promptly after removal of war restrictions. To cover such work, "seed money" should be laid aside now.

This, it seems to us, is sound regulation. This thought was expressed by FPC Commissioner Manly two years ago at the annual meeting of the National Association of Railroad and Utilities Commissioners and received considerable favorable comment.

On the other hand, it is just the opposite of the decision of the Arkansas commission to return all excess earnings to the customers. Also, it is contrary to the point of view of OPA and the President, and for that reason the Pennsylvania commission is to be congratulated for its courage to show wisdom in the face of such contrary views.

The Meaning of Less

LESS adjustment and less inspection, less insulation and less breakdown, less corrosion and less painting, less losses and less material, less regulation and less copper, less travel and less testing, less leakage and less tightening, less wear, less oil, less cleaning, less fire, less overheating and less weight, less decay and less preventive, less haulage, less replacement, less parts, less store-stock, less interference, less waste, less margin, less confusion, less individualism, less standardization. The list of "lesses" could be extended indefinitely, but it would only include more mutually incompatible pairs. Incompatible with one another, maybe, but not incompatible with the wholesome objective of less investment along with less upkeep.

All these items can be read out of or into the talks and the papers of the day. They reflect an eager desire to meet the certain loads of the future, but to do it more economically than ever before. "Less," therefore, does not signify curtailed expansion of the system facilities; it does apply to the factors of design and performance which will help a minimum design do an optimum job. Only in that way can delivered power hold its achieved supremacy in the realm of competitive cost.

One thing is certain beyond peradventure, and that is that power system engineers are finding the opportunity to be exploratory, meditative and critical about their past practices. They are conscious of and even anticipate the proddings of management to "get it down." That is why so much of the discussion is verging toward less of things, not less plant—there will be a heartening expansion of that—but less of the even mildly disheartening annoyances and minor weaknesses that make upkeep so sizable an item of operation. Nor is any of this inconsistent with an apparent tendency to question whether the minimizing of upkeep necessitates paying and building for eternity. Equipment does not necessarily have to be built for the ages and outstrip its own technological obsolescence in order to entail a minimum of maintenance. But that's yet another story.

The Supreme Court Boomerang

AFTER PACKING the Supreme Court with jurists sympathetic to New Deal legislation, it is not surprising to have the court boomerang. So many of the newer members of the court had some part to play in the administration enforcement of the provisions of the Holding Company Act that it is not possible now to get a quorum of the court to hear the North American case.

The Attorney-General thinks that the way out is to reduce the quorum from six to five, and at once a howl goes up that this is but another way of packing the court. There must be something in that, because if a five to four decision is not considered too good, how about a three to two opinion?

It's been eight years since the Holding Company Act became law, and the most important part of it still lacks judicial interpretation. In the Bond & Share case the industry wanted adjudication of Section 11, but the government was successful in limiting the case to registration. So long as the interpretation of this section remains in doubt the industry will be in a dilemma and so will the investors.

While there may be people who will welcome this impasse because it might prolong the hearing of the case sufficiently for remedial legislation to be passed if the 1944 elections are more favorable, this is not representative of operating opinion. Prolonged uncertainty is not healthy.

Semi-Annual Index Available on Request

Because of the necessity for conserving paper, the Semi-Annual Index of ELECTRICAL WORLD for the first half of 1943 is not bound in this issue.

The Index, however, is being printed separately and will be sent without charge to all subscribers who request a copy. Address all requests to Editor, ELECTRICAL WORLD, 330 West 42d Street, New York, 18, N. Y.

Stupidity or Cupidity of Kilgore Bill

SCIENCE, probably above all other professions, must work in a free atmosphere, untrammeled by any regimentation, in order to give full play to its inspiration. That is something that the framers of the Kilgore bill (S.702) seemed to have overlooked.

Moreover, men of science have little patience with inferior minds or with minds that lack scientific understanding. To regiment science through a non-scientific committee as proposed would be like waving a red flag before an infuriated bull.

But worse than the stupidity is the cupidity of the bill. Through a two-hundred-million-dollar bureau, scientists would be the bait to catch the desired industrials, for the bill sets up machinery whereby industries can be purchased or started, whereby the government may assume ownership of invention whenever it participates in any way in the development, whereby government control and authority extends beyond wartime into peacetime.

In an extreme national emergency, such as war, the rights of the individual and of a company must become secondary to the necessity for winning the war. But when proposed legislation attempts to regiment for war as a preamble to peace, it is time the people made themselves heard.

The Kilgore bill is one of the most dangerous bills ever proposed, not only because it attempts to regiment scientific brains, nor because it sets up a government priority whenever government assistance is accepted, but because so much money would be at the disposal of one bureau and because of the almost unlimited power it would give to this bureau. Let no one think that because he has no research laboratory with technicians he would have nothing to fear. Today he has independent laboratories to go to with the knowledge that his invention would be a secret. Should the Kilgore bill become law this freedom may disappear, and if it does, how is the small manufacturer to develop new ideas with the assurance that they will be his and his alone?

The bill may have all the unbiased appearance of a luscious peach, but it is as sour as can be underneath.

Post-war Steam Station Developments

REFLECTION on the startling developments in the production of power which followed the last war makes one give serious consideration to probable changes when the present war is ended.

By the year 1914 the steam turbine had been accepted as a more satisfactory means of power generation than the reciprocating engine. Then for a period of years following the end of the war came a series of new stations that started a revolution in station design. Among these mention might be made of the use of somewhat higher pressures at Springdale, of air preheaters at Colfax, of pulverized coal at Lakeside, of both higher pressure, higher temperature, bleeder heaters and pulverized coal at Cahokia, of the first topping station with 1,250-pound boilers and turbines with steam reheaters at Edgar station, and of the one boiler-one turbine plant with entirely water-cooled furnaces and welded piping at Gould Street.

In the quarter of a century after the last war studies of combustion processes, the introduction of the welded superheater elements and of satisfactory superheat control, rationalization of condenser construction, improved feedwater treatment, better furnace wall construction and changed air heater designs also contributed to improved thermal efficiency, so that the heat consumption of the best stations is now approaching 10,000 B.t.u. per kilowatt-hour output—a reduction of about one-half from 1914 figures. Meanwhile standardization and simplification of equipment tended to maintain the cost of the newer stations at a constant figure per kilowatt of capacity.

What will be the trend of future developments after this war? The answer is not evident, but certain known factors may contribute to the final result. For instance, intensive research on metals for use at still higher temperatures and on welding of alloy steels may lead to the employment of still higher superheats. Boiler designs are in a state of flux, with a noticeable trend toward furnaces of box-like water wall construction with practically all radiant heat absorption both for steam generation and to a large extent for superheaters. Automatic control of plant operation is now within sight as many excellent systems of boiler control are being given long-time tests. Then there is the question of elimination of the power house structure and the use of "outdoor" plants. Great stress will be placed upon reduction of unit plant investment and all improvements will be judged against this standard. The possibilities of "topping" older stations will be studied again, although it is more likely that complete new plants will be more economic. Finally, consideration must be given to the gas turbine, upon which much constructive development work is being done quietly at present.

These are but a few of the possibilities. Other ideas may possess more merit. Certainly a full discussion of this subject is justified as part of our post-war planning.

Washington Comment

RICHARD N. LARKIN, Washington Correspondent

Why Was Mandatory Brownout Shelved?

JUST WHY was the mandatory "brownout" dropped in favor of voluntary conservation? There are many rumors floating about which fail to consider numerous reasonably apparent facts.

The brownout was shelved only after several tentative orders for it had been drawn up and dissected from many angles. It was shelved because OWU concluded, with much of the electric utility industry more or less in agreement, that a better job could be done—and done more efficiently—under a voluntary program than under a mandatory program.

The idea behind the brownout, of course, was to save as much of those critical materials and facilities consumed in the generation and use of electricity as could reasonably be saved in view of the conditions under which the nation is living today. The idea of the conservation campaign, which is to replace the brownout, is to save the same materials and facilities, but more of them than could be saved by any of the various brownout orders OWU put together.

No Shortage

OWU found, during critical examination of its various orders, that it would be a back-breaking task to enforce any mandatory program with any large degree of equity. This was no problem in Atlanta late in 1941 when a summer-long drought left the southeastern region with badly crippled water resources. In that case some relief was necessary. Therefore the curtailment program was broad and impartial.

Such has not been the case with the brownout, which was to be instituted in all manner of places under all manner of conditions. Nor was the brownout designed to distribute an inadequate amount of power, but rather to remove most glaring nonessential uses of a plentiful supply.

OWU realized that no matter what sort of order it issued on brownout, there would have to be numerous exceptions to allow in some small way for infinitely varied local conditions. It knew that no order of such complexity was capable of being administered with the staff now available in Washington.

Some Exceptions

The matter of prescribing standards for exemptions and exceptions to the mandatory program was troublesome. The Office of Civilian Requirements complained that OWU's preliminary standards were too drastic. Some industry representatives thought other standards pretty lenient. One very difficult problem was the effect of the brownout on the small merchant who, unable to advertise in newspapers or on the radio, depends upon light for his advertising. OWU was reluctant to attempt anything which might dislocate competitive business conditions all over the country if the objectives could be attained otherwise.

Then there was the matter of the business man whose advertising sign just exceeds whatever limit might have been stipulated. Suppose all signs over 100 watts had been ordered out. Would this have meant all signs over 100 watts or would it have meant all signs over 125 watts? The question may sound absurd, but exactly the same problem was faced—and compromised—by Congress in the matter of the $50 exemption under the pay-as-you-go income tax plan.

Or consider the question of the open-air fruit and vegetable market versus the car-hop refreshment stand. The former needs lights everywhere that merchandise is on display at night. The refreshment stand needs lights for only the relatively small area near the stand itself, but these establishments customarily light up the whole business area. The one uses light as a working tool, the other as an advertising medium. Just where shall the line be drawn to insure justice to each?

Finally, there is the matter of enforcement. For persistent violators the answer is to shut off service. But for the enforcing agent, which would be the local electric company, there is a considerable public relations problem. On the company would fall the burden of proving that a customer was violating the order. On the company would fall the duty of reporting the violation to Washington. On the company would fall the burden of determining whether Washington's warning was being heeded, and, finally, it would be the company which would turn off the power. The idea of using civilian defense personnel for everything except turning off the service met with the reply that civilian defense duties are already sufficiently heavy without adding this program. In an industry long dedicated to service, enforcement of a mandatory program would be no easy matter.

Voluntary Conservation

OWU has put aside all these headaches for the present to see if a voluntary conservation program can do the job. The general outlines of the conservation plan have been indorsed by numerous industry representatives. OWU expects to work with other federal agencies to the end that fuel conservation be practiced on a much broader scale than that envisioned by the brownout.

There are vast conservation possibilities in the domestic use of coal. The brownout was expected to save 2,000,000 tons of coal yearly. Annual domestic use of coal approximates 180,000,000 tons. A 5 percent reduction in domestic use would mean a 9,000,000-ton saving.

Projecting this saving back shows considerably larger savings in ton-miles of transportation and in man-hours of handling and production than those anticipated under the brownout. The fuel and energy savings mentioned here do not begin to encompass those which may be expected. Figuring to save more with less trouble, OWU dropped compulsion for persuasion.

NEWS OF THE WEEK

Cooperation of Engineering Branches Urged at A. I. E. E.

Agency representing entire profession needed to consult on matters of national concern, both during war and post-war periods, President Osborne tells Cleveland technical meeting

More now than ever, now when the problems of post-war planning are second only to the job of winning the war, there is need for an agency representing the whole engineering profession to consult and to advise in matters of national concern, said Harold S. Osborne, in his presidential address to the summer technical meeting of the American Institute of Electrical Engineers at Cleveland, June 21-25.

Cites Utilities' Programs

Utilities are thinking now, said Mr. Osborne, of large programs for making their services available to many new customers, for improving the quality of their services and for adopting to peacetime practices the technique and processes now being developed under the stress and pressure of wartime conditions. But the carrying out of these programs is contingent upon exterior forces, social and economic, in which the engineer has no immediate professional interest, but which he must to a degree make his concern if his plans are to be successful. Therein lies the need for an agency to represent the engineer in national terms.

The necessity for close co-operation between all branches of engineering so strongly indicated in Mr. Osborne's address was echoed in the remarks of the incoming president, Nevin E. Funk, who said that the work of the electrical engineer in the coming year would meet new and greater difficulties. Different problems from those of the past are coming up as the war continues and they will require different solutions that can only be found by working together.

Comparison of a successful industrial organization to a smoothly running machine is common in figurative speech, said Joseph Slepian, Westinghouse, in his acceptance of the Lamme Medal. But this is not an apt comparison, he averred, for the industrial organization, being of human components, must of necessity be a loosely knit organism for not otherwise can the qualities of curiosity and initiative have play. In presenting the medal to Mr. Slepian, L. W. Chubb spoke of his important contributions to electrical engineering instancing the researches and the mathematical analyses of Slepian from which resulted the ignitron and major advances in circuit breakers. Speaking of the Lamme Medal, S. B. Williams, chairman of the award committee, commented on the fact that engineering progress is less extensive and more intensive today than in Lamme's time and that while individual contributions might appear to be not so spectacular they were none the less the accomplishments of great minds.

CASE HISTORIES—Just a sample of the 41 employees of the New Haven Division, United Illuminating Co., who donated a pint of blood each to the Red Cross in a recent day's service to the men and women in the armed forces. Apparently the professional surroundings did not prove unduly formidable to the donors

Many New Members

Pleasant features of the general session were the presentation to W. I. Slichter, national treasurer, of an illuminated scroll, signalizing his quarter century of service to the Institute and the introduction to the assembly of Col. John Millis, the Institute's oldest member, who joined in 1884, nearly sixty years ago.

According to the annual report of the directors, presented at the meeting, the Institute gained 1,217 new members in the past fiscal year and as of April 30 last, had 20,161 members.

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Co-op Buys Rural Line

The Redwood Electric Co-operative, organized in April to carry electric power to farms in southern Humboldt (Colo.) County, has purchased the Charles L. East light and power system, consisting of about 50 miles of rural power lines extending from Scotia to Phillipsville. For acquisition and rehabilitation of the line the co-op recently obtained a $200,000 REA loan.

Norfork Output to be Marketed by FWA

President Roosevelt has ordered the Federal Works Agency to take over marketing of the power output of the Norfork Dam generating plant when it goes into operation next December. The executive order, issued this week and based on the First and Second War Powers Acts, left maintenance and operation of the dam and power plant in the hands of the Corps of Engineers.

Marketing of Norfork power will be coordinated with that of the output of the Pensacola Dam in Oklahoma, and the four-mill energy charge now in effect on Pensacola's firm power will be extended to Norfork's 30,000-kw. when it becomes available. Pensacola output is firmed by purchases of off-peak steam power from neighboring utilities.

"Common Carrier" Asked

Due to the scarcity of copper and other materials for transmission lines, the President directed that the Norfork power be moved over facilities of neighboring utilities, of which Arkansas Power and Light Co. is the principal company. A spokesman for the Federal Power Commission said no "common carrier" actions in the matter have yet been brought before FPC. He predicted that any such arrangements would be worked out through negotiation between the companies involved and FWA. Under the President's October 22 "cheapest power" directive, however, FPC would have the duty or ordering such arrangements where necessary.

Pensacola, with a rated capacity of 57,600-kw., has been operating recently at about 68,000-kw. output, an FWA spokesman said. Ninety-eight percent of its power goes to war contractors.

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FPC Licenses Claytor Hydro

The Federal Power Commission has announced the issuance of a federal license to the Appalachian Electric Power Co., for the Claytor hydroelectric project (Project No. 739), located on the New River. The signing of the license brings to an end the long standing controversy between the company and the Commission concerning the extent of federal jurisdiction over the country's river-basin resources.

Appalachian Electric Power refused the license tendered by the commission in 1931 on the ground that the New River was not navigable, but the Supreme Court, in a decision handed down on December 16, 1940, sustained the commission's contention that the stream was navigable and the company must take a license.

The Claytor project is reported to have cost about $9,565,000, and has an installed capacity of 104,000 hp. Electric energy generated by the plant enters into the utility system of the Appalachian company which, with its affiliates, serves a large area in Virginia, West Virginia, and Ohio.

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125,000 Kw. Unit Goes in at P.S. of N.J.

A new 125,000 kw. turbine generator at Burlington station of Public Service Electric & Gas Co. of New Jersey was placed in commercial service last week. This addition, the company said, brings the total capacity of Burlington station to 305,000 kw.

Turbine generators added during the past six years to the systems at Burlington, Marion station in Jersey City and Essex station in Newark, represent generating capacity additions totaling 425,000 kw. and bring the entire capacity of Public Service's system to 1,133,650 kw.

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Tighten Order on Boilers, Condensers

Steam boilers, synchronous condensers, oil circuit breakers and liquid-filled power or distribution transformers may no longer be ordered or manufactured without specific authorization of WPB, under an amendment to order L-117.

The amendment does not affect approved orders for these items placed prior to June 15 or orders for equipment not controlled by L-117 before June 15 if ordered before then.

All boilers, excluding those designed for marine use or those for locomotive use, designed for pressures of 100 lb. per sq. in. or greater must be approved after application on form WPB 2645 (UF-25). Letter application must be made for authority to purchase synchronous condensers and oil circuit breakers whose capacity is 69-kv. or greater. Form WPB 2643 (UF-23) is required for approval of liquid-filled power or distribution transformers whose capacity is 1½-kva. or greater.

GENERAL CABLE "M"—Blanket award to all manufacturing plants of the General Cable Corp. of the U. S. Maritime Commission "M" and Maritime badges to the more than 12,000 workers employed by the company, was made last week when representatives of the company's plants participated in presentation ceremonies at Bayonne, N. J. At left is Commissioner Charles E. Walsh, Jr., Director of Procurement, U. S. Maritime Commission. In the center is D. R. G. Palmer, president of General Cable and on the right S. A. Smith, Jr., plant manager at Bayonne. Last November more than one-half of all General Cable employees were awarded the Army-Navy "E". This was renewed for continued efficiency in production on April 24, by the Army-Navy Awards Board.

Holding Companies Found More "Cooperative" by SEC

Commission's eighth annual report to Congress, long delayed, notes increase in number of voluntary plans filed to effect compliance with "death sentence" provisions of Holding Company Act

A greater willingness on the part of holding companies to comply with orders of the Securities and Exchange Commission, issued under Section 11 (b)—the death sentence phase—of the Holding Company Act, is noted in the commission's eighth annual report to Congress issued last week. The report covers the fiscal year ended June 30, 1942, and no explanation was forthcoming as to the reasons for the six-months delay in its preparation and submission.

Method Now Important

The commission, apparently encouraged by an increase in the submission of voluntary plans for compliance with the act, and with the number of favorable court decisions upholding the principles of the legislation, said that their major administrative concern at present relates to the final steps in achieving the objectives of the statute "namely, the choice between the various alternative methods available under the act for bringing about compliance with the requirements of Section 11 (b), and the determination of what treatment of the various claims of security holders is fair and equitable."

Mentioning specifically Section 11 (b) (1), the geographic integration phase, the report declared: "The past fiscal year has seen rapid strides toward ultimate compliance by all holding company systems with the geographic integration provisions of the act."

Pending court decisions should settle most of the legal questions still in dispute before the commission, the report stated, adding: "We are therefore moving toward the completion of the first stage of entering orders and getting the legal formalities behind us, especially with respect to procedure and interpretation. When that stage is completed with respect to the various holding company systems, each will know definitely where it stands in relation to the requirements of Section 11. How and when each order shall be enforced, is a matter of future determination in most of the cases."

The lateness of the commission's report precludes its covering some of the events which have taken place in the year since June 30, 1942. During that time, for instance, two of the larger holding companies—United Gas Improvement and Commonwealth & Southern—which had challenged the constitutionality of the commission's orders in the courts, filed voluntary plans to comply with the SEC's orders. In the former case, the company filed its partial liquidation plan and had it approved by the commission, without awaiting the outcome of the court case; in the latter, the company lost its court appeal and filed a one-stock plan under Section 11 (e) of the act, to comply with the commission's order.

Other holding companies which have filed voluntary plans during the current fiscal year include United Light & Power, Standard Gas & Electric, Federal Water & Gas, Ogden Corp., National Power & Light and others.

Holding company systems involved in Section 11 proceedings as of June 30, 1942, had consolidated assets aggregating $14,237,000,000 out of a total of $16,000,000,000 of consolidated assets of the 134 holding companies which were registered with the commission. The 134 registered holding companies constitute 53 public utility holding company systems, which include 1,342 holding, sub-holding and operating companies, according to the report. About 14 of them control consolidated assets of $12,195,000,000 and approximately 52 percent of the privately owned electric generating capacity in the country.

Supreme Court Test

Pending at the present time before the Supreme Court of the United States is the first major challenge on the constitutionality of the "death sentence" provisions of the Holding Company Act. After the close of the fiscal year covered in the SEC's belated report, the Court of Appeals for the Second Circuit affirmed the commission's integration order against the North American Co. and, subsequently, the commission joined with the holding company in petitioning the Supreme Court for a review of the case. The Court agreed but, due to four justices disqualifying themselves from participating, the case will not be heard before the October, 1943, session of the court. By that time, legislation to permit a simple majority of the court to decide an issue, rather than the quorum of six required at present, may have been passed. The other phase of the "death sentence"—corporate simplification—was also upheld by the Circuit Court of Appeals for the Third Circuit in the case of Commonwealth & Southern.

HONORS FOR WAGENHALS—Edward T. Wagenhals, general superintendent of the Ohio Power Co., retired recently after being in the continuous employ of the company since 1908. Fifty officials and associated employees honored him at a dinner on the occasion. Above, left to right: Graham Claytor, vice-president, American Gas & Electric; Mr. Wagenhals; C. E. Torrey, vice-president and general manager of Ohio Power, and Harold E. Turner, Mr. Wagenhals' former assistant, who has been named his successor

Accounting, Utilization Are Northwest Themes

Seattle and Portland round-table conferences of Northwest Electric Light and Power Association sections highlight war emergency approaches and planning for peace-time economy

Personnel problems in connection with the stabilization of wages rule, methods of handling and accounting for surplus material, internal auditing in the face of manpower shortage, new wrinkles in customers' accounting, and property retirement studies were the principal subjects explored at a conference of utility accountants in Seattle June 14-15, sponsored by Northwest Electric Light & Power Assn. J. H. Clawson, Puget Sound Power & Light Co., chairman of the Accounting & Business Practice Section, conducted the meeting.

Wage Classifications

In going from a 40 to a 48-hour week with time and a half for all over 40 hours, some companies had found themselves paying clerks more than their supervisors who were not affected by the over-time rule. This indicated an adjustment of such wages upward, and some companies had applied to the power commission, the War Labor Board and the Treasury Department for approval of an increase for these supervisors. Clause R. Groth, Pacific Power & Light Co., who led the discussion of this subject, pointed out that all companies should carefully classify and define the different jobs for the purpose of establishing wage schedules within those classifications.

The problems of handling and accounting for surplus materials above the practical working minimum stock were discussed by R. W. Lawlor, Northwestern Electric Co. Few companies had attempted to segregate surplus materials physically from other stock. One experiment of this character was being worked out in the Idaho Power Co. where a central warehouse was set aside for such surplus. Methods of tagging or ear-marking surpluses and accounting for them from month to month through stores, as applied by various companies, were examined.

C. P. Heidinger, Puget Sound Power & Light Co., brought out ways in which internal checks on cash handling and other accounting and bookkeeping processes could be carried on even though man-power in the company offices had been curtailed by the draft and by the syphoning off of labor by high-waged war industries.

Experiments in quarterly meter reading, estimating interim bills, meter reading by postcard, and other customer accounting short-cuts instituted in the past few months by several of the companies, were explored and found generally to be working out satisfactorily. E. W. Bredemeier, Portland General Electric Co., who led this discussion, told of using his meter readers (the company still reads monthly), for many types of customer contact formerly carried on by other employes.

Methods of establishing units of property for retirement records and the values that should be assigned to these units were the subject of discussion under V. T. Montgomery, Idaho Power Co. There was no complete agreement on how average prices should be established, though some companies argued for basing these averages on a five or 10-year period and not changing them too frequently for the reason that generally speaking the property retired consists of the older pieces of property. Paul R. Enright, Eastern Oregon Light & Power Co., presented an analysis of commission requirements with respect to account 100.5, Acquisition Adjustments, and account 107. A lack of uniformity in commission rulings was noted.

The possibility of securing a measure of uniformity between reports required by state utility commissions and state tax commissions was discussed under the leadership of T. W. Fryou, Portland General Electric Co. In this connection financial and operating statements to the management also came in for review, and methods of keeping these from multiplying and accumulating were brought out. This was shown to be particularly desirable in view of the short-handedness in most of the company accounting departments.

Utilization Conference

That Northwest utility men are facing their problems, immediate and future, squarely but with optimism was evidenced by round-table discussion at the Utilization Section conference of the Association at Portland, Ore., June 11 and 12. J. C. Plankinton, Northwestern Electric Co., was chairman of the sessions, which considered the dealer situation, customer service, the impending "brownout", personnel and other problems.

While dealer mortality has been general, electric appliance dealers have made money in the past and probably will re-enter the business when the war is over, was the consensus of the round table lead by D. B. Leonard, Pacific

UTILIZATION SECTION CONFERENCE—Pictured at the Utilization Section conference of the Northwest Electric Light & Power Assn. (left to right): J. C. Plankinton, commercial manager, Northwestern Electric Co. and section chairman; Berkeley Snow, executive secretary of the association; Pat Johnson, Puget Sound Power & Light Co. vice-president; Charles Hess, sales promotion manager, Puget Sound Power & Light Co.

Power & Light Co. The utility's job is to create the demand for equipment, it was pointed out, although power companies may have to do the selling in sparsely populated areas, at least for awhile.

Successful conversion of sales organizations to utilization work was reported, with Pat Johnson, Puget Sound Power & Light Co., pointing out that no cuts had been made in his company's sales force since 1941. Those remaining were doing work which otherwise would have to be done by operating men, without the better-trained, diplomatic sales approach, he said. R. B. McElroy, Washington Water Power Co., stated that any function or problem of the company that needed to be sold, any idea that involved customer relations could best be handled by the sales department.

Looking Ahead

Orland Mayer, Idaho Power Co., told how his organization helps local industries secure war subcontracts in a territory removed from heavy production centers. A utility can secure such contracts for its customers, he pointed out, by (1) arousing interest of all concerned—small local industries, larger industries holding prime contracts and government agencies involved; (2) finding out what is in demand; (3) organizing the industry or pool to make it; (4) helping with production difficulties and (5) going after repeat orders.

Speaking on postwar planning, Charles Hess, Puget Sound Power & Light Co., warned against thinking the temporary war prosperity will last. As some of the things which the industry may look toward, he suggested standardization in water heater design; laundry machines more fully automatic, with the automatic dryer and ironer coming into prominence. Home lighting will have to start again from scratch, war factory lighting will create a demand generally for better industrial lighting, street lighting is scheduled for a big development, he declared. Electric space heating and panel heating may come, he believes, and commercial electric heating should get a boost from the experience of Army and Navy cooks.

Joe Platt, Hotpoint representative, pointed out that first appliance production must be models stopped by war, that "dream" models would be a year or more in coming because of necessary retooling and testing. Frigidaire's representative, R. G. Hutchison, predicted that moving of essential machinery would necessitate a lapse of several months before appliance production would be resumed after the war.

Public Ownership Tax Exemption Hit at C. E. A.

President W. C. Mainwaring says Canadian privately owned companies pay over 20 percent of their gross for taxes; publicly owned companies less than 1½ percent—Brown elected president

A bitter attack against what he termed "the unfair taxation discrimination between privately owned and publicly owned utilities, featured the address of W. C. Mainwaring, general sales manager of B. C. Electric Railway Co., and retiring president of the Canadian Electrical Association, during the annual convention of that group held last week at the Seigniory Club, Quebec. The privately operated companies could prove, and should bring home to the public, he said, that "with the same exemptions from taxation as are extended to publicly operated utilities, we could most certainly quote equal, if not lower rates." To bolster his point, Mr. Mainwaring cited government statistics to show that the private companies pay out over 20 percent of their gross revenues in taxes, while the publicly owned companies pay less than 1½ per cent of gross for taxation.

TVA Example Cited

Noting that comparisons are sometimes helpful, Mr. Mainwaring cited the instance of the Tennessee Valley Authority. Figures recently issued by the management of TVA, he said, showed that at the end of 1942 there was an investment in power plant of $283,000,000. Operating income, before interest, of $4,280,252 was claimed, he said. "If interest were charged at only 3 percent on plant investment of $283,000,000 this would amount to $8,490,000 per annum, or $4,210,000 in excess of operating income. This is public ownership in the United States, and shows the extent to which the public treasury, i.e., the taxpayer, is being called upon to bonus power development by the government.

"How much longer are we who represent the privately operated companies going to sit idly by and let operators and proponents of publicly owned utilities dress up their annual statements to indicate their operations are highly successful when many of them are being heavily subsidized, are paying practically no taxes, and certainly are not being operated any more efficiently than privately owned companies?"

Mr. Mainwaring's remarks were prefaced by figures showing new water power development in Canada. As of Jan. 1, 1943, he said, Canada's hydraulic development totaled 9,225,838 hp. During 1942, new water power installations totaled 378,600 hp., and since the start of the war, another 1,600,000 has been added. Construction now under way, he revealed, will increase this figure by approximately 1,000,000 hp. during the next 18 months —"and we still have available for development approximately 80 percent of our total water power resources."

Discussing rural electrification, Mr. Mainwaring described the work done in that field by the publicly and privately owned companies and said the privately owned companies had "done most of the pioneering so far as the electric service is concerned in their communities without government aid or without expectation of reward other than the revenue received from the rendering of this service."

Brown Elected President

At the closing session of the convention, Alan Brown of Gatineau Power Co. was elected president. Vice-presidents elected were R. A. C. Henry of Montreal Light, Heat & Power Cons.; J. B. Hayes of Nova Scotia Light & Power Co., and J. K. Wilson of Shawinigan Water & Power Co. J. B. McCabe of Montreal Light, Heat & Power Cons. was elected treasurer of the association and B. C. Fairchild was again re-elected secretary.

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Arkansas P. & L. Co. Cited in FPC Order

The Arkansas Power and Light Co. has been ordered by the Federal Power Commission to show cause within 90 days why it should not be ordered to eliminate approximately $17,000,000 in write-ups. The commission warned that failure to cite specific facts in the answer may result in issuance of a final order without hearing.

In addition, the company was required to show cause why it should not prepare and submit reclassification and original cost studies with respect to approximately $47,000,000 more on its books.

Allow Some Production of Commercial Appliances

Drastic revision of WPB Order L-65 recognizes need for maintaining military and commercial civilian use—Tighten control over transfer and production of repair parts

A drastic revision of Order L-65, covering electrical appliances, which allows additional production for military and commercial civilian use and which tightens control over repair parts production has been issued by WPB. Order L-65 banned appliance production almost 13 months ago.

The revision opens no new production for general civilian use, and actually will eventually cut down on civilian appliance use through its ban on production of repair parts for luxury appliances.

Appliances Allowed

Flat irons and air and water heaters were added to the list of products which may be made freely for military and war shipping use. Production of broilers, food choppers, mixers, grinders, servers and slicers; fry kettles, griddles, hotplates, juicers, ovens, ranges, toasters, urns and vegetable peelers, already allowed for military and war shipping use, may be resumed for commercial civilian use on a limited scale. Only commercial and heavy duty types may be made, and manufacturers may not make more of these for civilian use than 10 percent per quarter of their 1940 output. Inventories of these items for civilian use may not exceed 15 percent of the 1940 production per item. This easing is aimed at relieving shortages of food preparation equipment in hospitals, war industry cafeterias and civilian operated training schools serving military personnel. Specific WPB authorization must be obtained for transfer of these items the order states.

Availability of copper is the limiting factor in curtailment of repair parts production. The amended order restricts copper use for repair parts to current-carrying parts of specified appliances, including air heaters, flat-irons, heating units for domestic ranges, hot plates and disc stoves, roasters and water heaters. Replacement cord sets are prohibited for all appliances except flat irons, and these will be restricted to 25 percent of 1940 production until the end of this year, after which 25 percent of 1940 production may be put out every six months.

Repair parts, production and inventory of which may at no time exceed total sales of the same parts during the previous six months, may not be transferred unless a similar used part is procured in exchange or unless assurances are given that a similar used part is being held for the manufacturer. Manufacturers may not transfer or use resistance material now held in frozen inventories without specific authorization to do so. Applications for such authorization may be made on form WPB-1319. Production and delivery reports must be filed monthly on form WPB-1600. Reports for June must be filed by July 10.

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Decision Reserved On Niagara Falls

The U. S. Court of Appeals for New York reserved decision last week on the appeal of the Niagara Falls Power Co. from an order of the Federal Power Commission requiring the company to transfer $15,537,943 from its fixed capital account to earned surplus, in connection with a dispute involving original cost of the company's project No. 16, a hydro-electric plant on the Niagara River.

The utility contended that the order, issued June 9, 1942, and a subsequent order, dated September 1, 1942 (ELECTRICAL WORLD, June 27, 1942, page 62; November 7, page 20) which required the company to comply with the original order within 60 days, violated its rights under a 50-year license granted by the commission on March 2, 1921. The company further argued that the commission lacked jurisdiction in the case. If the order were approved, the company argued, "the company's books would show a loss which it has not in fact sustained." The company further contended that the order made it impossible to distribute company earnings by affecting the company's credit, and that it deprived the company of "enjoyment of the reciprocal obligations both of its vested contract rights and of the Federal Power Act." It was further asserted that under the license agreement terms the fair value of the project was to have been determined by mutual agreement between the company and the commission, or by adjudication by the federal court.

MEETINGS

Previously Listed

American Society for Testing Materials—Annual meeting, William Penn Hotel, Pittsburgh, Pa., June 28-July 1. R. E. Hess, assistant secretary, 260 S. Broad St., Philadelphia, Pa.

International Association of Electrical Inspectors—Northwestern section, New Washington Hotel, Seattle, Wash., August 26-27; F. D. Weber, secretary, P. O. Box 70, Portland, Ore. Southwestern section, Los Angeles, Calif., week of August 30; H. L. Gerber, secretary, Room 205, City Hall, San Francisco, Calif. Western section LaSalle Hotel, Chicago, Ill., September 13-15; F. H. Moore, secretary, 320 N. Meridian St., Indianapolis, Ind. Eastern section, New York, N. Y., week of September 20; F. N. M. Squires, secretary, 85 John St., New York, N. Y. Southern section, Roosevelt Hotel, New Orleans, La., September 27-29; C. M. Jones, secretary, 307 Trust Co. of Georgia Bldg., Atlanta, Ga.

American Institute of Electrical Engineers—National technical meeting, Salt Lake City, Utah, September 2-4. H. H. Henline, national secretary, 33 W. 39th St., New York, N. Y.

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Revise C.E.O.C. Wage Formula

The President's "hold the line" directive of April 8 has altered the proposal for maintaining wage differentials between supervisors and the men they direct which was forwarded to the industry last March by the Council of Electric Operating Companies. (ELECTRICAL WORLD, April 3, 1943, page 65.)

Latest CEOC bulletin lists three measures available to employers, as follows:

1. Plans for scheduled increases which are based on established practice and were in effect prior to last Oct. 3 may be continued.

2. Any plan previously approved by a Salary Stabilization Unit may be continued.

3. A new formula for maintaining supervisory differentials allows supervisors first above ordinary workmen to be paid up to 80 percent of the differential which existed before the work week was extended beyond 40 hours. Supervisors second above ordinary workmen may be paid up to 60 percent of the differential, and supervisors immediately above them may be paid up to 40 percent of the differential. Above this point, the formula becomes highly involved.

It is emphasized that each of these plans should be discussed with local Salary Stabilization Units before becoming operative. In allowing increases to supervisors, the increase is added to the weekly pay of such supervisors before the work week was extended.

Week's Output Continues Rise

Continuing the seasonal rise begun the second week of June, the output curve rose again during the week ended June 19, according to figures released by the Edison Electric Institute. The amount of electrical energy distributed by the light and power industry during that week totaled 4,098,401,000 kw.-hr., compared to 4,040,376,000 kw.-hr. the week previous and 3,925,893,000 kw.-hr. during the week of June 5. Figures for the latest week represent an increase of 19.4 percent over the corresponding week last year.

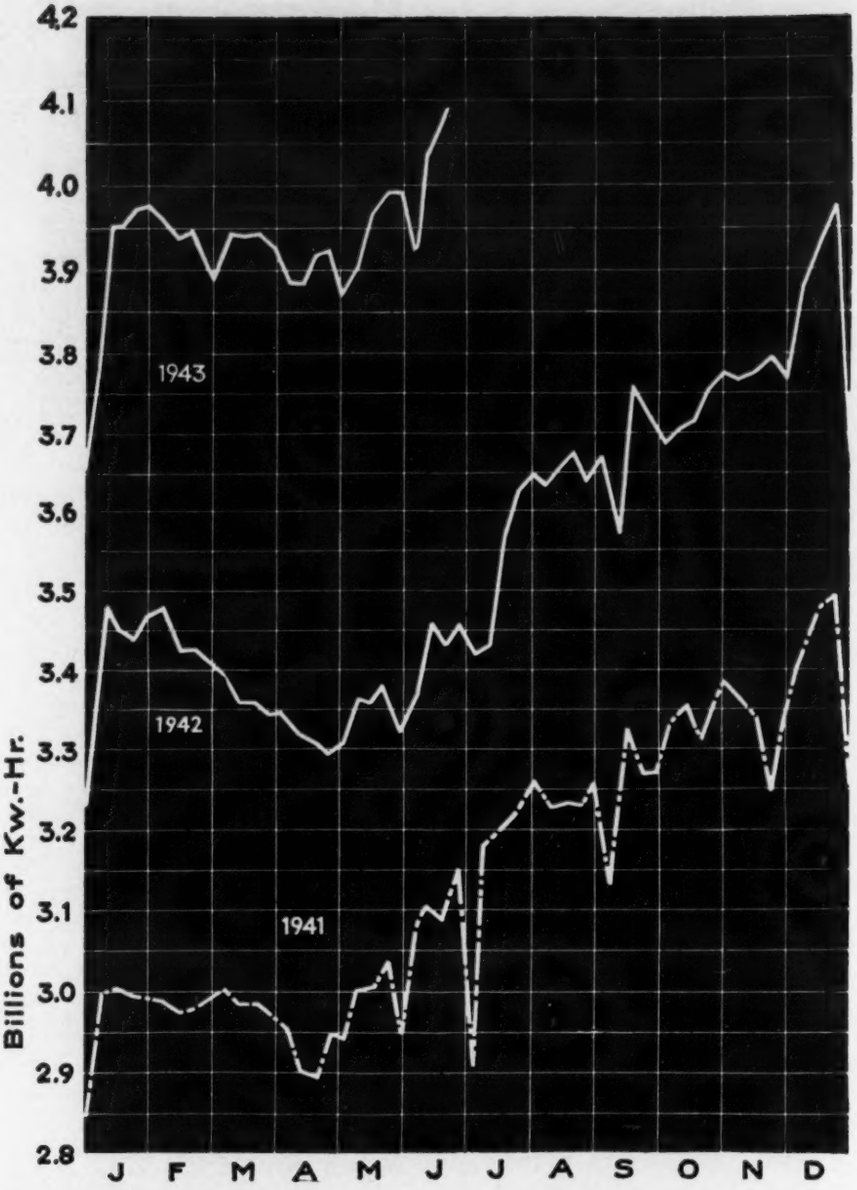
All the major geographic regions of the country contributed to the increase compared to the week previous, with the exception of the Pacific Coast area. But the Pacific Coast, with a 27.4 percent increase over the 1942 week, continued to lead the country in amount of gain.

Weekly Output, Millions Kw.-Hr.

1943		1942		1941	
June 19	4,098	June 20	3,434	June 21	3,091
June 12	4,040	June 13	3,463	June 14	3,101
June 5	3,926	June 6	3,372	June 7	3,076
May 29	3,990	May 30	3,322	May 31	2,955
May 22	3,992	May 23	3,380	May 24	3,040
May 15	3,969	May 16	3,357	May 17	3,011
May 8	3,904	May 9	3,365	May 10	3,001
May 1	3,867	May 2	3,304	May 3	2,945
Apr. 24	3,925	Apr. 25	3,273	Apr. 26	2,950
Apr. 17	3,917	Apr. 18	3,708	Apr. 19	2,897

Percent Change from Previous Year

	Week Ending		
	June 19	June 12	June 5
New England	+ 8.4	+ 7.7	+ 5.0
Mid-Atlantic	+17.7	+15.8	+14.6
Central Industrial	+16.1	+13.2	+11.8
West Central	+14.9	+10.3	+10.7
Southern States	+25.9	+20.2	+21.3
Rocky Mountain	+12.5	+11.8	+19.2
Pacific Coast	+27.4	+28.4	+28.6
Total United States	+19.4	+16.7	+16.4



Coordinate Work on Nutrition

A three-way agreement between the Council of Electric Operating Companies, the Edison Electric Institute and the Food Distribution Administration has been reached according to President Tom P. Walker of the Council. The plan is aimed at bringing about closer cooperation between home service activities of electric operating companies and the FDA.

EEI's Home Service Committee, which is already promoting cooperation on a local and state-wide basis, will continue to make contacts and collect reports in this field. CEOC will maintain contact with the war agencies involved. EEI and CEOC will continue their interchange of information.

Under the plan, each operating company has been asked to designate an employee to coordinate its nutrition activities with those of local and county committees. A representative for utilities in each of the seven FDA districts covering the nation will also be appointed. These representatives will work with regional nutritionists of FDA to insure the greatest possible coordination between federal and private activities in each region. Selection of the regional utility representatives is being made in cooperation with EEI's Home Service Committee. In states in which there are a number of operating companies, a state utility representative also will be named.

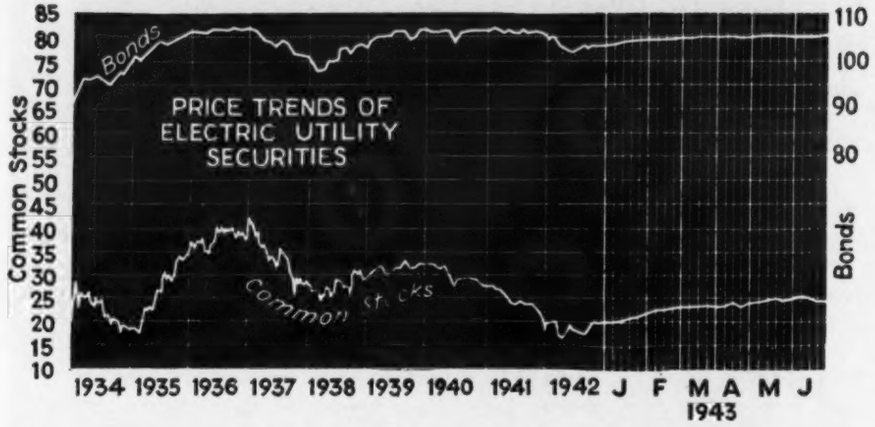
EEI will prepare for FDA at the end of the year a report showing all the work in this field done during the year by operating companies.

Electric Rate Reductions Made by N. Y. Utility

Rate reductions for electricity by the New York Power & Light Corp. in two of the company's service areas which will result in savings of approximately $40,000 annually to consumers, have been announced by the New York Public Service Commission.

One of the revisions, applicable to the Greenwich district, amounts to a reduction of $20,000 per annum for residential use only. The new rate is effective June 26. The other reduction is applicable in the Hoosick Falls district, which was formerly served by the Twin State Gas & Electric Co. The net reduction on this filing amounts to about $19,700 and will become effective June 30.

Utility Stocks Index Firm; Bonds Gain



There were few changes in prices of electric light and power stocks during the past week, the "Electric World" index remaining at 24.7; last year, 18.6. Bonds gained slightly, advancing to 106.0 from 105.7; last year, 102.8

Decision on United Deferred by Court

Hearing was held in Federal District Court at Wilmington, Del., recently on a petition of the Securities and Exchange Commission for a court order enforcing the provision of the voluntary dissolution plan of United Light & Power Co. The court took the matter under advisement.

Under the plan, which received SEC approval last April, United Light will contribute cash and minor investments to its subsidiary, United Light & Railways Co.; distribute its remaining assets, consisting of all the outstanding common stock of United Light & Railways, among the stockholders of United Light & Power. After these transactions have been concluded, it will dissolve.

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April Revenues Up 7.5 Percent

Electric operating revenues of the larger privately owned electric utilities in the United States in April, 1943, were $236,107,000, as compared to $219,675,000 in April, 1942, an increase of 7.5 percent, according to a report issued by the Federal Power Commission.

Revenues from sales to ultimate consumers were up 7.8 percent to $214,261,000, and electric operating revenue deductions (including operating expenses, depreciation and taxes) were $182,498,000, or 8.3 percent over those of April 1942.

Net electric operating revenues increased 4.9 percent to $53,614,000 and gross income, including other utility operating income, increased 3.8 percent to $65,947,000. Income deductions decreased 4.4 percent to $24,492,000. Net income in April, 1943, was $41,455,000, an increase of 9.4 percent over the net for April, 1942.

Revenues by classes of service in April, 1943, compared with the same month of 1942 were as follows: Industrial, an increase of 15.8 percent; residential, an increase of 5.5 percent; commercial, a decrease of 1.1 percent. Operating expenses in April, 1943, were $100,537,000, or 8.2 percent greater than those of the same month last year. Depreciation charges were increased 5.3 percent to $24,618,000 and taxes increased 8.8 percent to $56,605,000.

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North American Co. Calls More Bonds

North American directors voted recently to redeem $1,500,000 additional 3¾ percent series, due 1954, of the company's outstanding debentures. The debentures are to be redeemed July 15 at 102 plus accrued interest.

On August 1 a further amount of $338,000 of debentures will be retired through the sinking fund, making a total of $38,850,000 debenture indebtedness paid off since April 15, 1941. The original amount of $70,000,000 of debentures will then have been reduced by more than 50 percent to $34,150,000.

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Utility Reports

	Net Income 1943	1942
*California Electric Power and sub	$938,743	$814,447
*Carolina Power & Light	2,369,447	2,806,440
*Central Arizona Light & Power	903,764	637,369
‡Commonwealth & Southern and subs	13,035,176	11,289,756
†Consolidated Edison N. Y. and subs	29,867,468	32,693,453
*El Paso Electric (Texas)	566,656	618,399
*Houston Lighting & Power	3,149,016	2,593,653
*Key West Electric	61,119	77,781
*Minnesota Power & Light	1,834,260	1,554,207
*Pacific Power & Light	1,033,222	672,439
*Pennsylvania Power & Light	5,749,881	5,558,998
†Portland General Electric	1,802,966	1,477,760
*Savannah Electric & Power	221,938	178,279
*Virginia Electric & Power	4,046,719	3,721,578

* Twelve months ended April 30.
† Twelve months ended March 31.
‡ Twelve months ended May 31.

FINANCIAL BRIEFS

THE SEC HAS JOINED the FPC and the South Carolina Public Service Commission in approving the merger of Lexington Water Power Co. into South Carolina Electric & Gas Co. Both companies are subsidiaries of General Gas & Electric Corp.

THE SEC HAS SET June 30 for hearing on an amended plan of reorganization of Peoples Light & Power Co. and consolidated the hearing with proceedings brought by the commission against the company last March under Section 11 (b) (2) of the Holding Company Act.

MILWAUKEE ELECTRIC RAILWAY & TRANSPORT CO. has applied to the SEC for permission to buy for cash at par from Wisconsin Electric Power Co., its parent, 8,000 shares of its own capital stock having a par value of $100 per share or an aggregate par value of $800,000, and to retire the stock so purchased.

DELMARVA ELECTRIC COOPERATIVE has asked the SEC to delay its decision on a proposal of U.G.I. or its subsidiaries to buy the common stock of the Eastern Shore Public Service Co. of Delaware. Counsel for the co-op declared that within a reasonable time it would submit a plan under which it would pay $1,000,000 for the stock, instead of the $850,000 offered by U.G.I. and accepted by General Gas & Electric Corp. and Virginia Public Service Co., holders of the stock.

AMENDMENTS TO THE AMENDED PLAN of reorganization of Laclede Gas Light Co., subsidiary of Ogden Corp., have been filed with the SEC and the Missouri Public Service Commission. Changes call for a reduction in the amount of proposed debt to be outstanding; changes in interest rates from 3¾ percent to 3½ percent, a larger cash investment by Ogden and a larger stock distribution to the parent company.

HOW DESIGN... CONSTRUCT OPERATE MAINTAIN

Porcelain Insulators for Tree Service

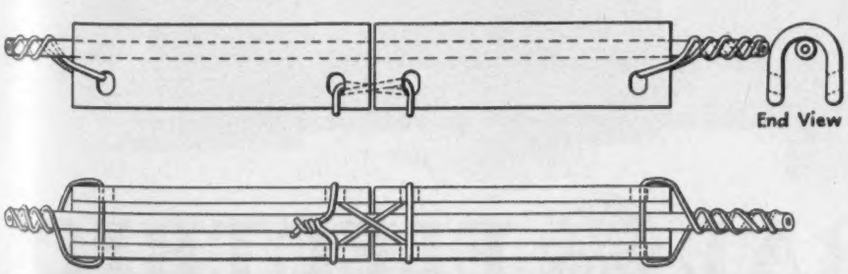
For a permanent insulation that can be used to prevent energized wires from grounding on tree trunks or large branches a porcelain tree insulator has been developed, designed to stand continuous rubbing action at point of contact.

The tree insulator, developed by the Porcelain Insulator Corporation, Lima, N. Y., is a U-shaped glazed porcelain unit which will fit over wires up to 1 in. O.D. For determining pounding action due to wire and tree swaying, laboratory impact tests showed that it withstands 100 blows of 90 in.-lb. with a wood-nosed hammer applied at the middle of one insulator side.

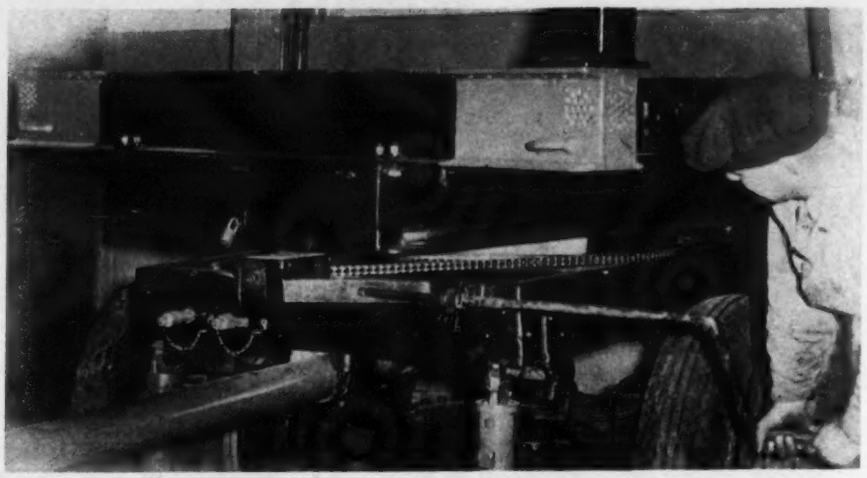
By using a U-shape, the insulator can be placed easily over the wire to be protected. Two tie-wires hold the insulator securely in place; one is threaded through the two adjacent holes at each end of the insulator and secured along the wire from the end of the insulator. Two or more insulators may be placed end to end on the conductor to be protected, the abutting ends being fastened by a tie-wire.

Many varieties of tree guards have been employed in the past, most of them fabricated from wood or other fibrous material, which eventually broke down and charred under the combined action of voltage and moisture. Porcelain has been used in the form of an insulator attached to the tree limbs, but this acted as an abrasive and rapidly wore the wire down to its breaking point.

The porcelain tree guard attaches to the wire so that the abrasive action is between the limb and the porcelain, thus providing complete freedom from wire abrasion, and at the same time provides a high-grade inorganic insulation to withstand the voltage stress from conductor to ground.



OUTLINE of two tree insulators tied together and attached to one conductor



HAND CRANK turns bolster of pole trailer to cant wheels and guide long poles around sharp corners in trails and roads

Corners No Problem to This Pole Trailer

A bolster that can be turned about its vertical axis is the novel but notably useful feature that has been incorporated in the design of a heavy-duty pole trailer built recently by employees of the Union Electric Company of Missouri at the River Mines generating station.

By turning the bolster, when the trailer is loaded with extra long transmission poles, it is possible to cant the trailer wheels and thus negotiate sharp corners in narrow trails and roads that would be otherwise nearly impossible for a load of 90-ft. poles. In this respect the movable bolster functions the same as the rear steering wheel on the familiar hook and ladder truck of a fire department.

Of course, when the trailer is not loaded, operation of the hand crank, as shown, merely turns the bolster. However, when the trailer is loaded the poles hold the bolster in a fixed

FOR CORROSIVE LOCATIONS. These all-immersed combinations are made in two forms—for both corrosive and hazardous locations.
DUST-TIGHT COMBINATIONS. Available through NEMA size 5—these starters are for application in dusty locations
NEW HIGH-VOLTAGE COMBINATION. This provides split-cycle short-circuit protection and starting means for high-voltage motors.

GENERAL ELECTRIC

670-93C-5490

HEY BILL!
YOU'RE DOUBLING YOUR WORK WHEN YOU INSTALL CONTROL THAT WAY!
EVER HEAR OF G-E COMBINATION MOTOR STARTERS?
BY using G-E combination starters, you can cut the time required to install motor control by 50 per cent. That's because "combinations" combine two controls—a motor-circuit switch (with short-circuit protection) and a magnetic starter—in one, compact, easy-to-mount unit.
But that isn't all—combination starters save critical material by eliminating unnecessary conduit; and they offer your operators better protection because the case door is interlocked with the safety switch.
Save man-hours and critical material by specifying General Electric combination starters. General Electric Company, Schenectady, N. Y.
WATERTIGHT COMBINATIONS For outdoor application and for installation in damp locations.
FOR HAZARDOUS LOCATIONS Enclosed in a high-strength, alloy case, these starters are ideal for Class 1, Group D, locations.
FOR GENERAL-PURPOSE USE These combinations are for indoor applications where atmospheric conditions are normal.

BINATION STARTERS FOR MOTORS FROM 1 TO 1000 HP

position and the trailer axle and wheels are canted.

The mechanism for turning the bolster consists of a worm gear, turned by a hand crank, that drives a pinion which is chain-connected to a 44-in. diameter flat-plate gear wheel attached to the bed of the bolster. The worm gear reduction was taken from a Blackburn hoist, but the larger flat plate gear wheel was made specially for this application.

While it is still necessary to stop the truck and trailer in order to turn the bolster, in turning sharp corners, this arrangement is quicker and much more convenient than backing and jockeying the combination in narrow woods trails leading to transmission structure locations.

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Signal Corps Erects Plywood Mast

Earlier structures of tubular steel have recently been superseded in the Signal Corps by a 75-ft. mast of resin-bonded plywood. Erection by two men is reported to have been easy, the whole weighing but 250 lb.

The Weldwood (a development of United States Plywood Corporation) is of course rust- and corrosion-proof and substantially lighter in weight than the former metal masts; there is advantage in easy portability and lower freight rates. The masts are guyed. The plywood veneers are bonded with Durez phenolic resins.

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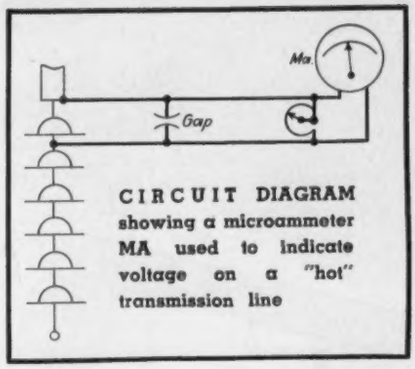
Transmission Line Voltage Indication

By LLOYD F. HUNT
Southern California Edison Company, Ltd.

An inexpensive method to indicate the voltage of a transmission line utilizes a very sensitive a.c. instrument shunted across the ground insulator of a string, as shown in the illustration. In some cases the two instrument leads are in lead-covered cable for 400 ft. or more. Potential transformers are usually out of the question because of cost considerations.

The instrument is a 0-100 microampere Westinghouse a.c. meter with an adjusting rheostat of 15,000 ohms. This combination is a good "hot" line indicator, but the indication will vary with the humidity of the air. To overcome the variation the dial is calibrated and marked for voltage on a day of average humidity. Then when subsequent readings are taken on other days, it is only necessary to adjust the rheostat until the same reading is obtained. This procedure assumes, of course, that the voltage of the line is the same at all times; this is true a large percentage of the time. The instrument has proved itself very useful in service.



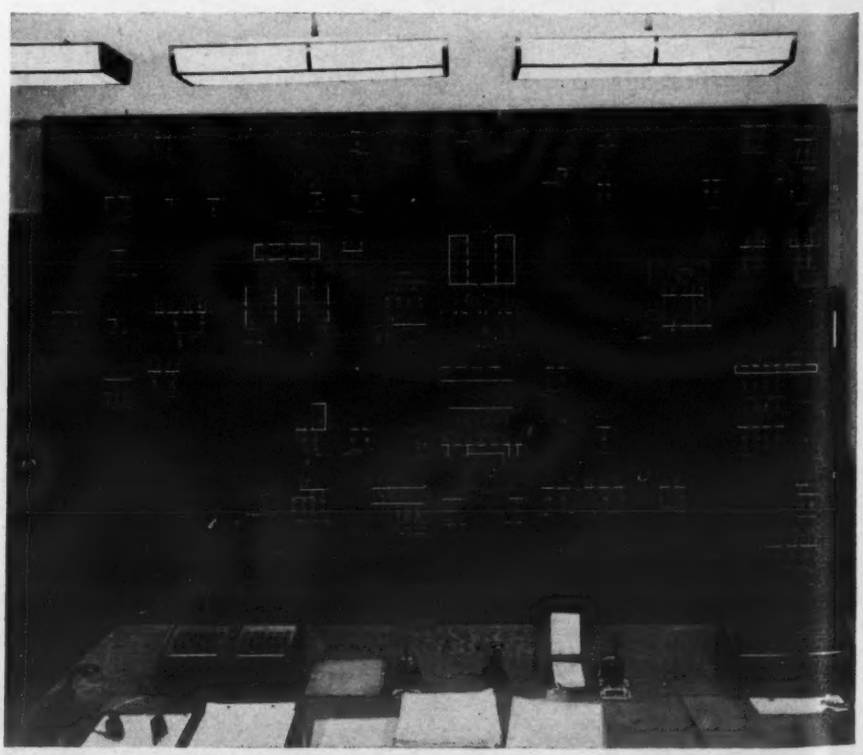
CIRCUIT DIAGRAM showing a microammeter MA used to indicate voltage on a "hot" transmission line

Using the original bushing with low-voltage capacitance taps it was necessary to use a one-tube amplifier to obtain good voltage readings. With the new a.c. microammeters now available it is possible to use the instruments as direct-reading voltmeters for this purpose. An 0-300-a.c. microammeter need only be connected directly to the capacitor tap. To adjust the meter, a suitable rheostat is connected in parallel with the instrument.

Dispatching Board Simple, Perpetual

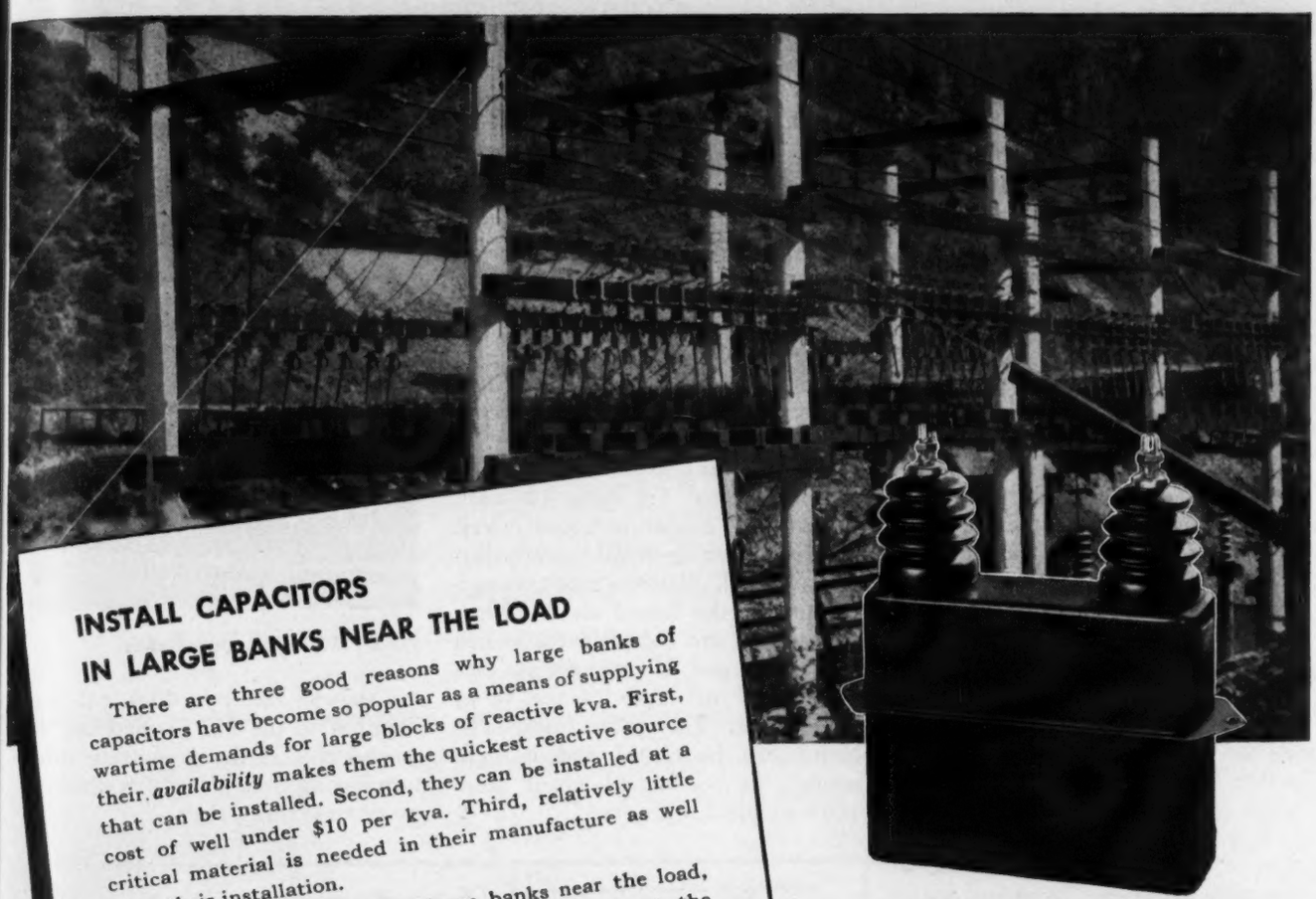
A new dispatching board installed by an Eastern utility has 630 hand-turned ball-units to indicate circuit changes in the diagram. Meanwhile, another Eastern utility has installed a board with 480 similar plug-in indicators, but about 10 percent are lighted by supervisory-controlled switches and breakers. In this respect the two boards typify a trend toward reducing the cost and complexity of wiring which is necessitated when a board is made fully automatic in its indications.

The manually operated board is 8 x 15 ft. and was built by the Braidwood Uniturn Systems, Perth Amboy, N. J. The front and back panel sections are of a black laminated material which can readily be removed and revised if diagram changes have to be made to keep abreast of system alterations. The conductor lines, accessory symbols and engraved characters are all of thin plastic materials cemented on by electric heat to form the diagram in superficial relief. Holes are provided for inserting multi-colored ball-units which are revolved by the finger tips to give the desired indication. All turnable indicators out of finger-tip reach are operated by means of a rubber-tipped wand. The



SYSTEM operating board has removable panels, plastic lines, symbols and ball-units manually set to indicate switch positions

Quickest Way TO SUPPLY REACTIVE and RELEASE SYSTEM CAPACITY



INSTALL CAPACITORS IN LARGE BANKS NEAR THE LOAD

There are three good reasons why large banks of capacitors have become so popular as a means of supplying wartime demands for large blocks of reactive kva. First, their *availability* makes them the quickest reactive source that can be installed. Second, they can be installed at a cost of well under $10 per kva. Third, relatively little critical material is needed in their manufacture as well as in their installation.

By installing capacitors in large banks near the load, the generators and transmission lines throughout the system will be relieved of reactive load, and thus will be free to deliver more kilowatts.

Banks of G-E Pyranol capacitors are available as large, outdoor and indoor rack-type equipments. Many companies have found it advantageous to mount outdoor-type units on temporary structures, so they can use these capacitors in smaller groups on distribution circuits when the emergency need for larger banks is past.

Ask your G-E representative for his suggestions on the application of capacitors in large banks. He'll be glad to help you with such problems as fusing, relay protection, and switching. Or write for Catalog GEA-2764B. *General Electric Company, Schenectady, N. Y.*

This large bank of 288 capacitors was recently installed by a Western power company to release system capacity. The largest of seven installations, it consists of 4320 kva of 15-kva Pyranol capacitors. All of these installations have wood structures.

PYRANOL CAPACITORS

GENERAL ELECTRIC

MODEL BOARD serves in demonstrating various types of connections

board shown has 630 such ball-unit indicators.

The other board, with both manual and remote indication, is 6 x 10 ft. and has newly developed "Glo-Peg" pilot-light indicators wired to 44 supervisory controlled switches and breakers in nearby substations. These are lighted by miniature lamps in sockets on the back-panel sections and are so designed as not to heat up the operating front panels. This is accomplished by having "cold-light" transmitted to each operating symbol by a plastic light extender and by relying on the intervening air spaces to insulate the lamp heat from the diagram.

It is obvious that this rapid dissipation of heat will prolong the life of the lamp filaments. The sockets are of an especially flat design, so that the indicating lights can be spaced closely and the lamps replaced either from the front or back of board.

Alternate red and green lights (SPDT) are both in one target. On-off lights (SPST) are interchangeable for red, green or clear.

•

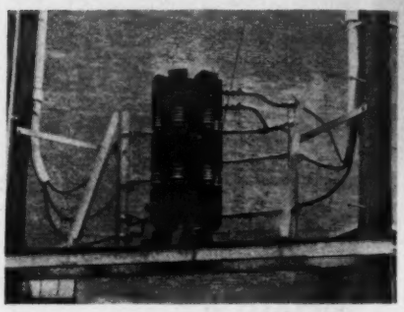
Study Connections From Model Board

At the overhead standards and transformer connections school for linemen conducted by the Wisconsin Electric Power Company, Milwaukee, this instruction board has been found helpful in demonstrating various types of connections. Low-voltage three-phase, 240-volt power is brought in to the main switch on the board and through three 120-volt, 110-watt lamps, one in series with each phase lead, to the primary conductors. Actual 1:1 ratio 100-watt, 120-240-volt miniature transformers, obtained from electrical manufacturers, are used. Students make connections with the board dead. When connections are complete the switch is closed, and if connections are wrong one or more of the series lamps light. This saves fuses. The board can be closed and is light enough to be carried about from place to place with ease.

Feeder Reactor Saves Over-Fusing

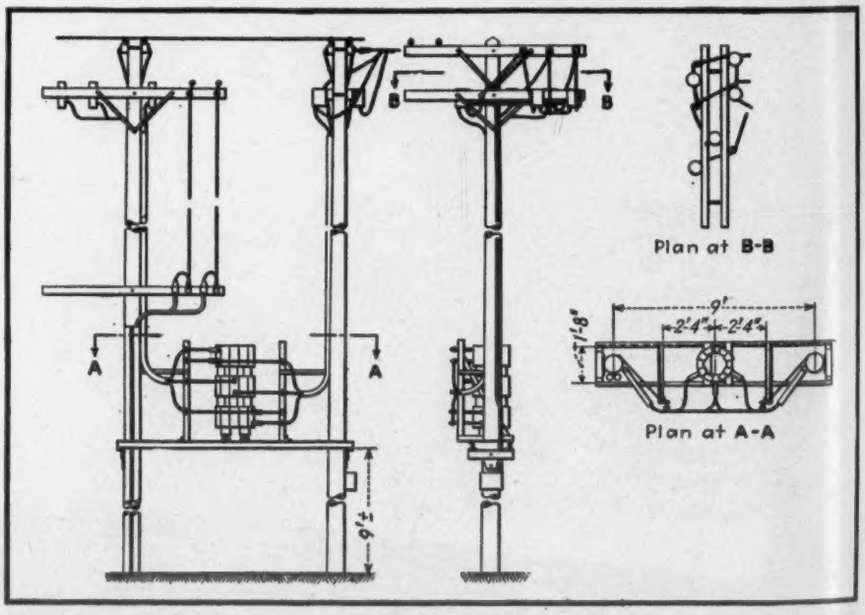
An Eastern utility serving war industries supplies one customer within 500 ft. of the main generating plant over a 2,300-volt, three-phase, No. 2 copper feeder. Fuses in the step-down transformers at the industrial plant have a maximum capacity of 10,000 amp., whereas local short-circuit possibilities at the bank totaled 20,000 amp. To reduce the danger of interrupting service and avoid over-fusing, the utility provided a pole-type reactor in the generating station yard in this circuit about 150 ft. from the main bus. The reactor is 50 in. high, 22 in. in diameter, weighs 700 lb. and has a rating of 13.3 volts at 150 amp., or, in terms of inductance, 0.236 millihenries.

Details of the reactor mounting

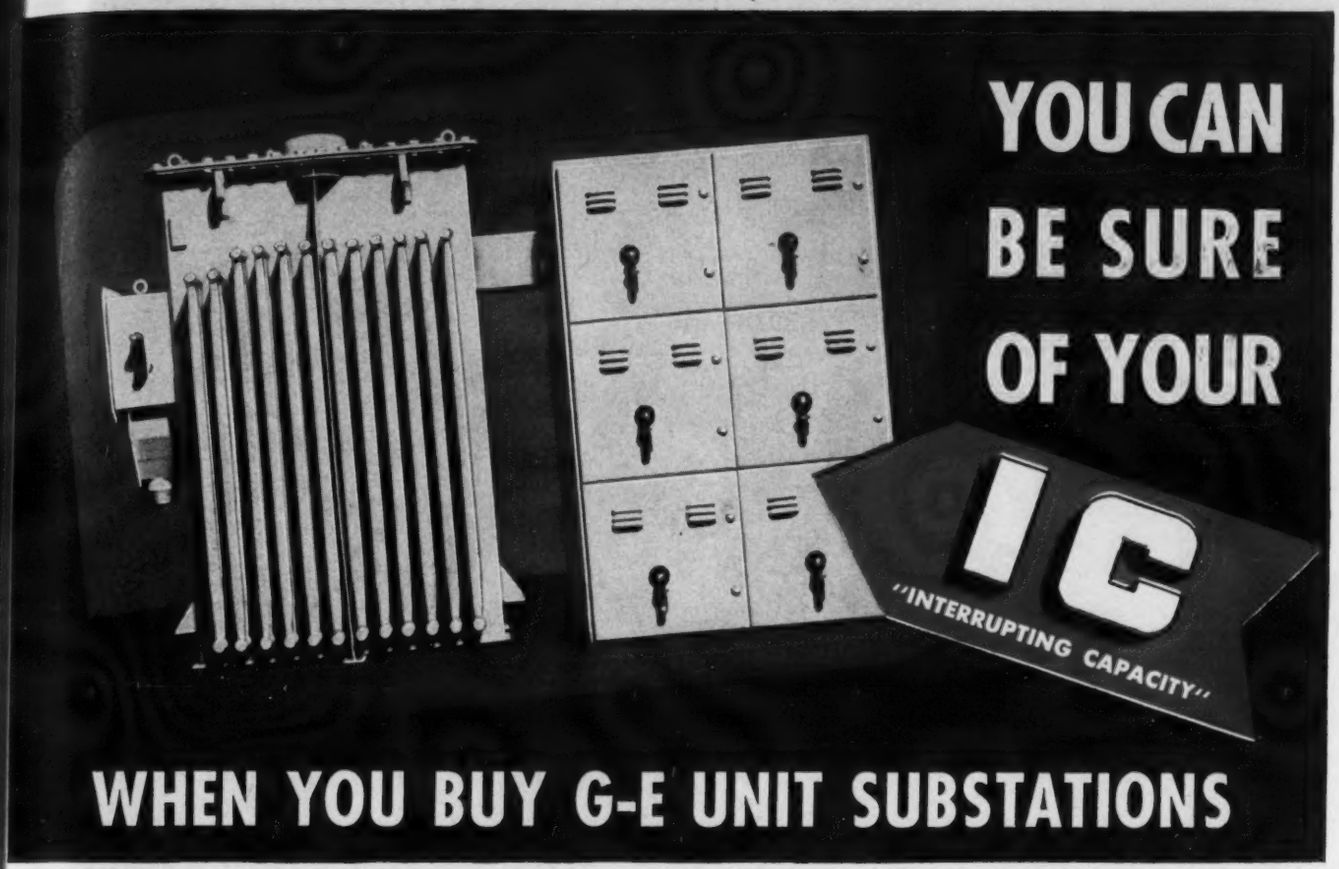


POLE-TYPE reactor installation

are shown. One new 40-ft. pole was required in the bill of material, the second pole of the supporting structure having been already available to carry an existing riser.



OUTLINE of reactor mounting



WHEN YOU BUY G-E UNIT SUBSTATIONS

The severity of a short circuit depends largely on the capacity of the substation that feeds the circuit, NOT on the normal load on the circuit. To assure you of *adequate* interrupting capacity for even the most severe short circuits, G-E load-center unit substations are built with *properly rated* breakers. These are air circuit breakers which have been co-ordinated—electrically, mechanically, and thermally—with the capacity of the substation and the system.

G-E drawout air circuit breakers are properly rated — can be inspected quickly and safely — and need little maintenance throughout a long life.

FOR DEPENDABLE PERFORMANCE—

G-E air circuit breakers have positive-acting, dual-magnetic, overcurrent trips which provide time-delay protection for overloads (adjustable from 100 to 200 per cent of the breaker rating), and instantaneous protection from short circuits. Silver-to-silver contacts, fast-acting arc quenchers, and generous current-carrying elements assure reliable operation.

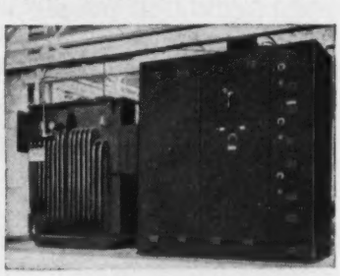
—AND EASY MAINTENANCE

Drawout air circuit breakers, which roll in and out as easily as a file-cabinet drawer, can be inspected, tested, or replaced with another breaker quickly and safely. After a power interruption, a simple turn of the breaker handle quickly restores service. Air circuit breakers in your G-E unit substation assure an important saving in time and labor required for routine inspection and maintenance.

If you need dependable load-center unit substations in a hurry, or simply want more complete information, get in touch with the nearest G-E office, or write to General Electric, Schenectady, N. Y.

FOR D-C, TOO—

RECTIFIER UNIT SUBSTATIONS



Now you can have direct-current power at your load centers by running high-voltage a-c all the way, and converting to d-c with rectifier unit substations located at those centers.

GENERAL ELECTRIC

302-18-5900

Suppose they hadn't been on the air for 343 weeks . . .

Suppose the girls of the G-E MAZDA Lamp Hour of Charm weren't today reaching an audience of 16,000,000 people a month . . .

Suppose they *hadn't* delivered over 500 lighting messages in the past six and a half years that the program has been nationally broadcast.

Do you suppose there would be the same appreciation of the benefits of good lighting as there is today?

Do you suppose that at the end of the war there would be as big a potential market for new lighting among those millions of listeners?

The G-E Hour of Charm is the only nation-wide lighting program on the air. Every Sunday, 10 P.M., EWT, over 125 NBC stations. See how it tells the benefits of light for production—just as it told America about better light for better sight before the war—and will again after the war. Listen also to "The World Today" weekdays 6:45 P.M., EWT, CBS.

G-E MAZDA LAMPS

GENERAL ELECTRIC
HOUR OF CHARM
Opening Announcement

ANNOUNCER

Here is a very significant message from the production manager of a middle western war plant. His factory makes artillery shells. A job calling for high speed -- and high precision. Listen to what he says.

VOICE

Our shell factory was going great guns in the daytime, but lagging badly on the night shifts. Night production was 40 per cent behind daytime production. And that condition -- across the country -- could be deadly serious.

Well -- we licked that problem -- with the help of a lighting engineer. He surveyed our plant and made some commonsense recommendations which we carried out. Today we are producing at top speed right around the clock. As a production man who has been through this experience, I strongly recommend that every war factory look into its lighting.

ANNOUNCER

Thank you. Friends -- if you are responsible for any sort of war production, won't you at least have your lighting checked up? It may make a big difference, especially in your night production. All you need to do is phone your nearest G-E MAZDA lamp office or your Electric Service Company, Electrical Jobber or Contractor. A wartime lighting Counsellor will call, check your lighting, and tell you how to correct what is wrong. There is no charge, and no obligation. All you have to do is make that phone call.

A typical Hour of Charm announcement on light for production. Here is Dick Stark, announcer, reading a lighting message as Evelyn, First Lady of the Orchestra, waits her cue to play.

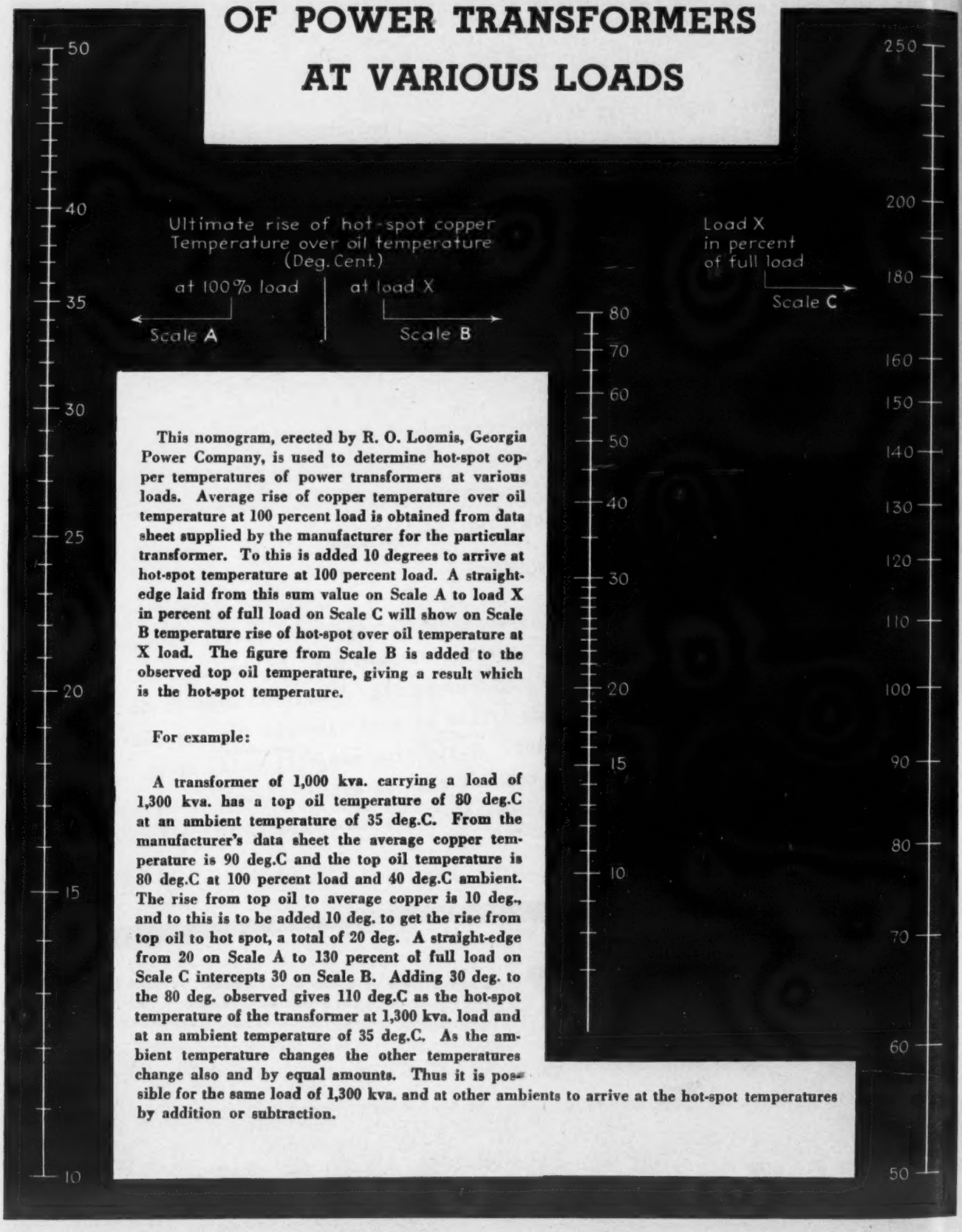
The best Investment in the World is in this Country's Future—Buy War Bonds!

GENERAL ELECTRIC

(2147) 71

HOW TO DETERMINE

HOT-SPOT TEMPERATURES OF POWER TRANSFORMERS AT VARIOUS LOADS



This nomogram, erected by R. O. Loomis, Georgia Power Company, is used to determine hot-spot copper temperatures of power transformers at various loads. Average rise of copper temperature over oil temperature at 100 percent load is obtained from data sheet supplied by the manufacturer for the particular transformer. To this is added 10 degrees to arrive at hot-spot temperature at 100 percent load. A straight-edge laid from this sum value on Scale A to load X in percent of full load on Scale C will show on Scale B temperature rise of hot-spot over oil temperature at X load. The figure from Scale B is added to the observed top oil temperature, giving a result which is the hot-spot temperature.

For example:

A transformer of 1,000 kva. carrying a load of 1,300 kva. has a top oil temperature of 80 deg.C at an ambient temperature of 35 deg.C. From the manufacturer's data sheet the average copper temperature is 90 deg.C and the top oil temperature is 80 deg.C at 100 percent load and 40 deg.C ambient. The rise from top oil to average copper is 10 deg., and to this is to be added 10 deg. to get the rise from top oil to hot spot, a total of 20 deg. A straight-edge from 20 on Scale A to 130 percent of full load on Scale C intercepts 30 on Scale B. Adding 30 deg. to the 80 deg. observed gives 110 deg.C as the hot-spot temperature of the transformer at 1,300 kva. load and at an ambient temperature of 35 deg.C. As the ambient temperature changes the other temperatures change also and by equal amounts. Thus it is possible for the same load of 1,300 kva. and at other ambients to arrive at the hot-spot temperatures by addition or subtraction.

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LONGER LIFE • NO LOW CELLS
GREATER DEPENDABILITY

For circuit breaker operation and other stand-by and control installations, Philco Flote' Batteries consistently provide longer life and better all 'round performance. Philco Flote' is the only battery specifically engineered for modern full float service.

Philco Flote' grids are cast in a special Flote' metal which reduces *by 40%* the amount of current required to keep the battery fully charged! Not only is this an important saving in operating costs, but low current consumption materially lengthens the life of the cell! Philco grids are strong and extra thick, designed to retard peroxidation by exposing a minimum of grid surface.

For complete details of Philco Flote' engineering features and specifications, write for the new Philco Control and Auxiliary Power Battery catalog.

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STORAGE BATTERY DIVISION • TRENTON • NEW JERSEY

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the 1943 WAR-TIM

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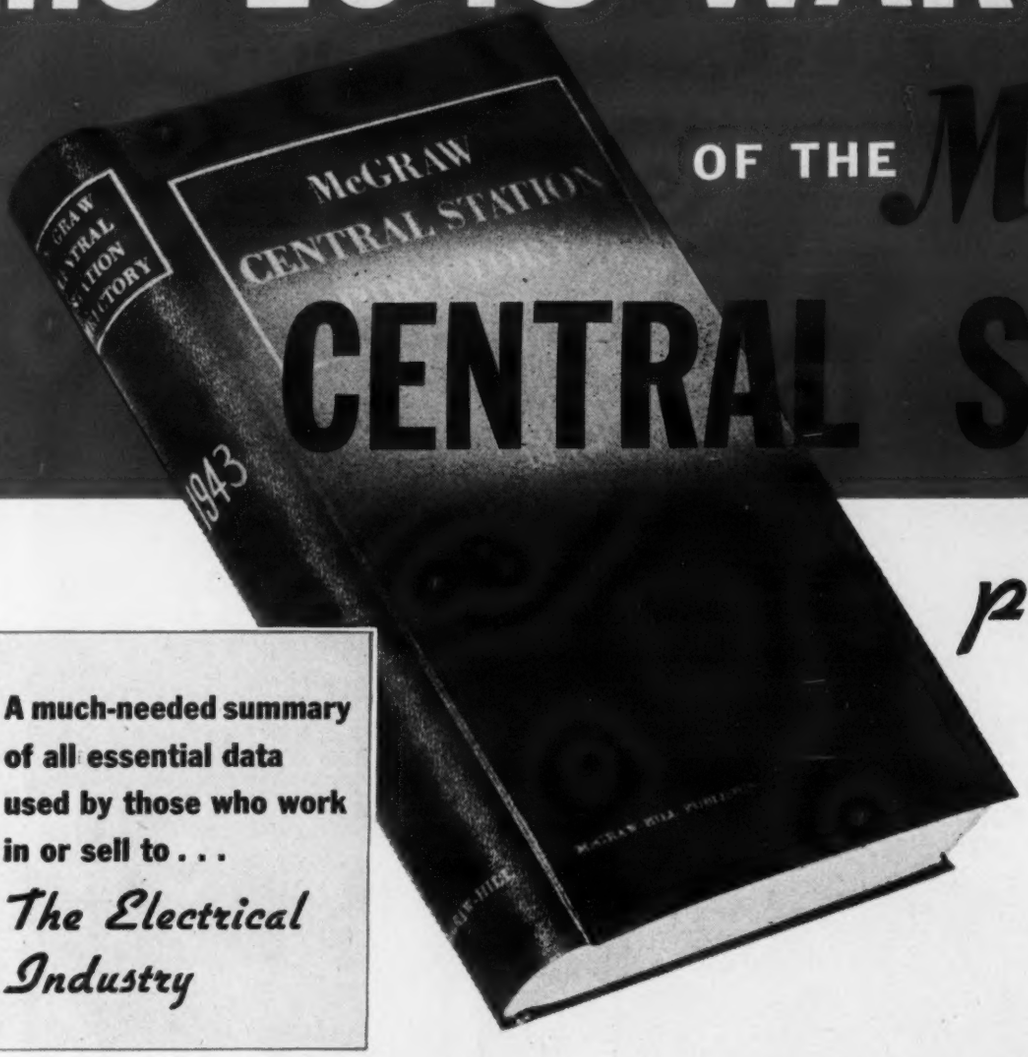

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The Electrical Industry

THE WAR-TIME EDITION GIVES YOU THESE FACTS FOR INTELLIGENT PLANNING:

- Names and addresses of independently owned and municipally operated electric light and power companies in the United States, Canada and U. S. Possessions; also, government controlled projects, State Commissions, and National and State Associations.
- Names and addresses of affiliated, holding, controlling or managing and service companies with complete lists of properties controlled or managed by each, and including names and addresses of principal officials.
- Names and addresses of officials and chief operating men for all operating companies, including:

Presidents	Superintendents of Transmission	Mechanical Engineers
Vice Presidents	Division or District Superintendents	Plant Engineers
General Managers	Plant Superintendents	Commercial or New Business Managers
General Superintendents	Chief Engineers	Merchandising Managers
Superintendents of Distribution	Electrical Engineers	Division or District Managers
		Purchasing Agents

- For each operating company, the following information is presented:

Company total and Plant individual generating Capacity in kva. or kw	Circuit Miles Underground — duct distribution
Kind of Prime Mover and Capacity in hp.	No of meters served
Amount of power purchased in kw. hrs.	Location of power plants
Type of current distributed, No. of wires, phase, voltage and cycle.	Location of districts or divisions
	Complete list of towns (of 500 Population or over) served
	A complete alphabetical index of companies listed

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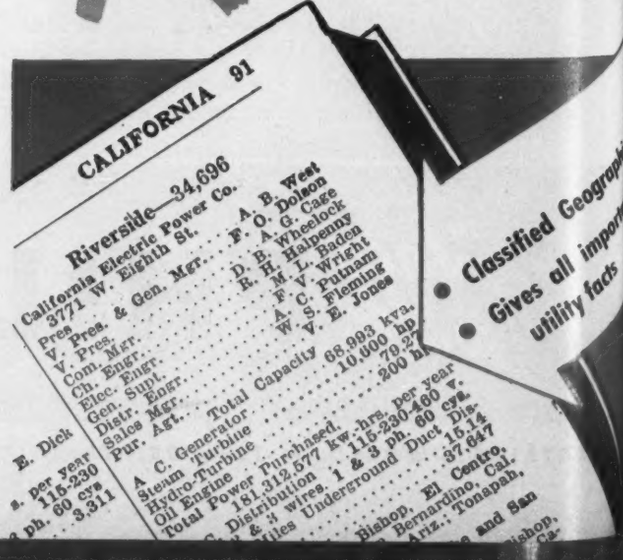

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operations and personnel

If you work in or sell to the electric utility field, you'll need the 1943 war-time edition of the McGraw Central Station Directory.

War conditions have had a tremendous influence on electric utility operations and personnel. Shifts in population have changed the size and importance of many utilities as power needs for war industries and housing have developed. New men have come in to replace technically-trained employees now in the armed forces. Other key men have shifted jobs in the same organization or have moved to different companies.

Gasoline rationing and selective service have also cut the sales force of the manufacturer serving the estimated 1943 utility-market of $300,000,000. To avoid wasted time and money spent in mail or personal contact work, correct, up-to-date facts are essential, whether for engineering, selling, contracting or statistical purposes.

The 1943 war-time edition lists every discoverable utility change occasioned by war conditions. For each of 4,000-odd utility plants you'll find exclusive data on organization, personnel, equipment and operations.

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of the

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Manufacturers of Electrical Generating, Transmission and Distribution Equipment:

- To secure names and addresses of executive, supervising, managing and engineering officials.
- To determine electrical characteristics of plant, equipment and lines now in use.
- To know the scope of utilities' operations, as indicated by the given total generating capacity, towns and number of meters served, etc.

Manufacturers of General Equipment and Supplies:

- To secure names and addresses of general managers and superintendents, mechanical and plant engineers, purchasing agents and others.
- To determine general size and scope of operations — and hence the probable purchasing power for plant, office, right-of-way and other requirements.

Electrical Utilities:

- To know the organizational structure of every other utility—especially those in their own or adjoining regions — whether independent, municipal, affiliated, holding, controlling or managing.
- To keep posted upon movements of officials from company to company.
- To size up any discernible trends in expansions of operations.

Financial Houses, Consulting and Contracting Engineers, Commissions and Others:

- To keep posted on all changes in executive, supervising, managing and engineering officials.
- To know the organizational structure of each company — whether independent, municipal, affiliated, holding, controlling or managing.
- To secure the complete picture of each company's size, scope and electrical characteristics of operations.

McGRAW-HILL PUBLISHING COMPANY
CATALOG AND DIRECTORY DIVISION
330 West 42nd Street, New York City

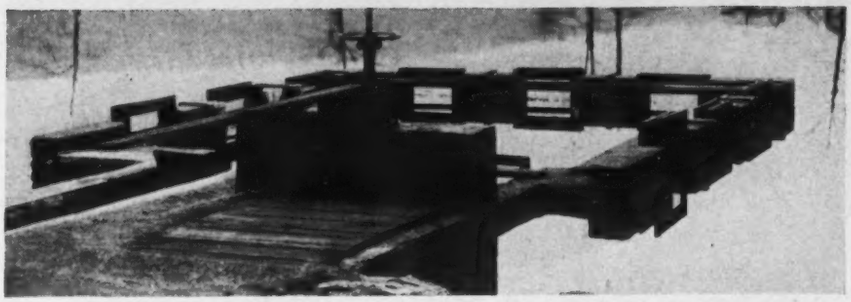


FIG. 1—Removable ¼-in. wire screens in duplicate in concrete crib keep trash from entering condensing apparatus

Ponds Circuited for Year-Round Water

Condenser cooling water for the 3,875-kva. generating plant of Orange Rockland Electric Company at Monroe, N. Y., is obtained from two small, shallow lakes adjoining the plant. These lakes are fed by streams which drain a 1.361-square mile watershed; the plant takes the water from the smaller lake, which has only 8.8 acres of surface, but is divided by a causeway and artificial island into two pools. In extremely cold weather to keep ice from forming on the screens the water is taken from and discharged into the smaller pool (Fig. 2).

When the temperature is only moderately cold the water is taken from the small pool and discharged, by means of a diversion-Y in the discharge sluiceway, into the larger pool and circulated through an opened gate in the causeway.

During warm months the larger lake is brought into play. Its 74 acres have an average depth of 7.9 ft. and store 25,369 cu.ft. To insure a circulating route long enough to cool the water adequately by mixing and evaporation, a 200-ft. causeway was also extended from the shore of this lake to an island in it. Still further length of circulation can at some future time be obtained by building another dike some 500 ft. long to a second island.

Less than 1 in. difference in level is needed to maintain ample cooling water flow and the pumping power at full operation of the plant in hot weather never exceeds 116 hp.

Screens at the intake keep trash from getting into the condenser and pumps. A concrete crib about 20 ft. square has three sets of double screens on each of the three exposed sides. These screens are of ¼-in. mesh in wooden frames and each has a small trough across the lower edge to catch any debris that drops off as the screen is pulled out for cleaning. While the outer screen is being cleaned the inner one bars any remaining fish or debris, and it, in turn, can be cleaned after the outer one is restored. This arrangement has no moving parts to wear out and the screen mesh can be replaced at intervals at low cost.

•

Synchronizing Wound-Rotor Motors—III*

By A. F. METZGER
General Electric Company, Boston, Mass.

A method for synchronous operation of wound-rotor motors having different ratings was applied to a drive in a textile plant in Rhode Island and has proved itself a complete success since installation "prior to Pearl Harbor." The plant has a mangle and padder driven by a 3-hp., 900-r.p.m. wound-rotor motor and a tenter driven by a 10-hp., 900-r.p.m. wound-rotor motor. As the two machines were sometimes used independently, they could not be belted together, yet when they were operated in range with a strip of cloth going through one and then the other, the two machines had to start, accelerate and run in exact synchronism to avoid stretch or slackness in the cloth.

Operating speed had to be adjust-

*Concluding article. Parts I and II were published in May 29 and June 12, 1943, issues of "Electrical World."

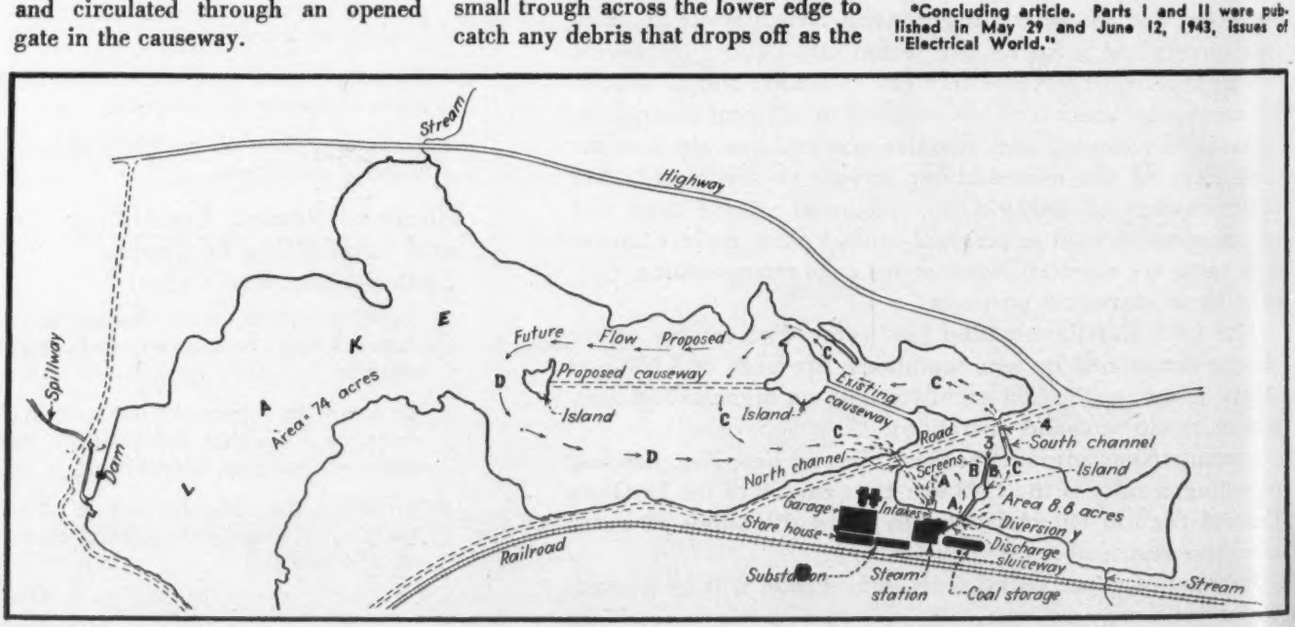


FIG. 2—Two lakes converted by gated causeways to form four pools for condensing water supply

(a) In extreme cold weather wood gate at Point 3 is closed and swing gate in diversion-Y swung south to discharge water into small north pool.

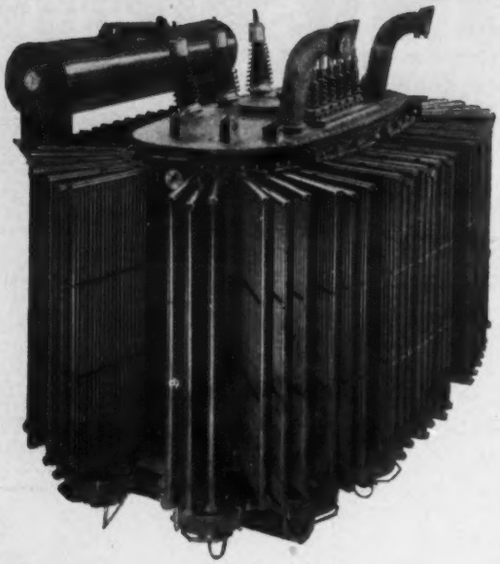
(b) In moderately cold weather gate 4 is closed, gate 3 opened and swing gate in diversion-Y swung to discharge into larger south pool.

(c) In summer gate 3 is closed and gate 4 opened to induce circulation along path C.

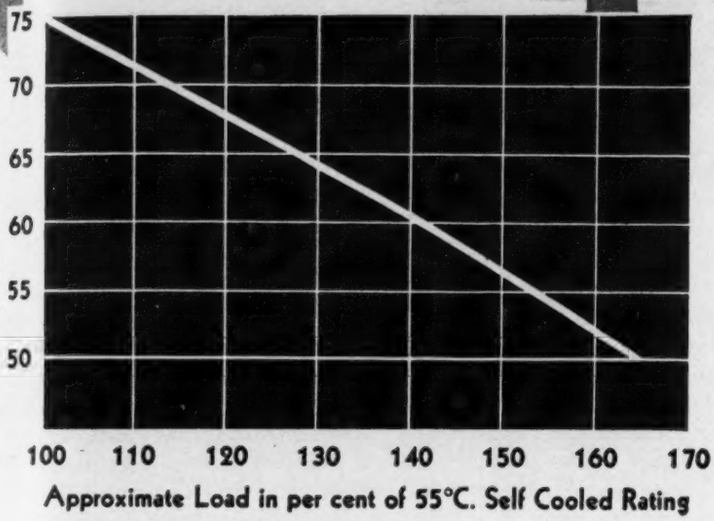
SIMPLIFIED REFERENCE TABLE TO HELP ANY OPERATOR

OVERLOAD

PENNSYLVANIA POWER TRANSFORMERS



20,000 kva, 25-cycles, OISC, outdoor, three phase, rated 44000-6600 volts, with forced air cooling equipment to permit increase in capacity to 26667 kv-a without exceeding temperature rise of 55° C.



It is not always necessary to provide additional cooling in order to obtain additional capacity. Low ambient temperature, low load factor, and similar conditions will permit the transformer to be overloaded to the extent shown on the curve, as long as the corresponding permissible oil temperatures are not exceeded.

HOW TO USE OVERLOAD TEMPERATURE CURVE

With any continuous load shown on the curve, the corresponding top oil temperature must not be exceeded.

EXAMPLE: If a transformer, while carrying 100% load, is found to have a top oil temperature of 75°C., and it is desired to carry 30% overload on this transformer, additional cooling must be provided to bring the top oil temperature down to 64°C. when the transformer is carrying 130% load.

ADDITION OF FORCED COOLING

Increased rating may be obtained economically by the addition of forced-air-cooling fans, or forced-oil-cooling units. For information as to type, number, and size of fans and cooling units, you are invited to consult our Engineering Department.

LIMITATIONS

The above guide applies to Pennsylvania Power Transformers which have been properly operated and maintained. The oil must be in good condition as indicated by dielectric strength and color. Samples of oil may be sent to our factory where they will be tested without charge.

Before applying overloads to transformers, a careful check should be made of the thermal capability of all associated equipment, such as circuit breakers, switches, current transformers, cables, meters and relays. Before exceeding 135% load on any transformer, it is recommended that advice be obtained from our Engineering Department as to any limitations involved, such as oil expansion, pressure in sealed-type units, bushing ratings, etc.

Standard transformers available in sizes up to 150 Kva.
Write for our new catalog on Distribution Transformers.

Pennsylvania
TRANSFORMER COMPANY
PITTSBURGH, PENNSYLVANIA

Pennsylvania TRANSFORMERS

able between the limits of 450 and 600 r.p.m. The problem was a perfect setup for selsyn operation because the mill already had the motors available. Although they were eight-pole, 900-r.p.m. motors, the speed range was only 450 to 600 r.p.m.

The only new equipments needed were three air-cooled, single-phase transformers which could be connected into a three-phase auto-transformer bank rated 2.71 kva., 22 amp., 71/90 volts, and a new 15-hp., continuous-rated resistor. The drum switch which the mill had for use with the 10-hp. motor had sufficient current-carrying capacity to handle the combined secondary currents and the magnetic primary switches could both be operated by the same interlock on the drum switch.

The booster transformers selected operate, of course, at rotor frequency, which varies over a range from 60 cycles, at the instant of starting, down to about 12 cycles at maximum running speed. Because secondary voltage varies directly with frequency, standard 60-cycle transformers are used.

Equipment Cost

The only equipment expense was for the three transformers, which cost approximately $10 each and which were delivered in four weeks, and a resistor costing about $61. If a standard application had been recommended the company would have been forced to order a new 10-hp. motor and primary switch and a new 20-hp. drum controller and resistor with a total cost of $555 and wait more than 20 weeks for delivery. Thus, this particular scheme saved the textile manufacturer a four-month wait in making the change-over and better than $450. (Note: Costs and deliveries are values at "before the war.")

It is believed that this method of obtaining selsyn operation of wound-rotor motors may have a considerable field of application. In situations similar to the foregoing example, this scheme may save the purchase of an unnecessarily large motor for a machine which requires only a small amount of power when operating separately, but much more power when synchronized with other equipment. By this method it is no longer necessary to have the wound-rotor motors identical on two machines just to handle occasional demands for synchronous operation.

Pin Pickling Plant

PICKLING PLANT for treating oak high-tension insulator pins

In the shop of the Montana Power Company is an insulator pin pickling plant for the treatment of oak high-tension insulator pins with paraffin. Two standard vacuum-pressure steam-jacketed tanks, as shown in the accompanying illustration, constitute the central feature of the plant.

A tub made to fit inside the tank is loaded with pins, as many as it will take, which is about 375 for the average 16 x 1½-in. pin. Enough 130-deg. melt paraffin is then added to cover the pins, this being first brought up to 200 deg. by application of steam to the steam jacket. Then the vacuum is put on for 15 hours, the 200-deg. temperature being maintained. About 20 in. of vacuum can be obtained with the equipment. This sucks all moisture out of the pins, the resulting steam being exhausted into a tube condenser. Use of the condenser permits getting a substantially higher vacuum. After being on vacuum for 15 hours, 12 to 15 gal. of water is removed from the load of pins, leaving them dry through and through.

The vacuum is then turned off and the system thrown over to pressure at 80 psi., which is left on nine hours. The pins then take up the paraffin to the extent of approximately 8 oz. per pin. When they come out they are really impregnated.

•

Maintenance Routine for Steel Towers

Transmission line steel towers, like wood poles, must be given adequate attention in inspection and maintenance if maximum service is to be obtained from them. Paint does peel off and galvanizing does deteriorate and the only way to prevent these incipient troubles from becoming real damages is to find and correct them early. One utility with a large-area system, after a line of towers has been in place a number of years, inspects all towers in one year. Thereafter one-fifth of the towers each year, so as to complete inspection of all in five years. Towers in bad locations are inspected regularly every year.

The form used to report inspections of towers and maintenance work done on them is filled out by the crew foreman at the time the work is done. Filed with previous reports, it constitutes the office record of tower condition. The figures of man-hours and costs are posted from the reports to make a summary record, which goes to the general manager of the utility.

TOWER REPORT

CONDITION OF BODY AND STUBS

Tower No. _____ Name of Line _____ Date _____

Surrounding Conditions:
Open field and swampy near river

BODY—Condition of ☐ Galvanizing or ☐ Paint. Check which:

Near Face	1-2	O.K.
Left Face	2-3	O.K.
Far Face	3-4	O.K.
Right Face	2-4	Peeling

STUBS	Condition	Reduction of Metal	Type of Soil
No. 1	Good	None	Black loam
No. 2	Good	None	Black loam
No. 3	Galvanizing failed	Est. 40%	Black loam
No. 4	Galvanizing failed	Slightly pitted	Black loam

Stubs Painted No. _____ Stubs Replaced No. _____

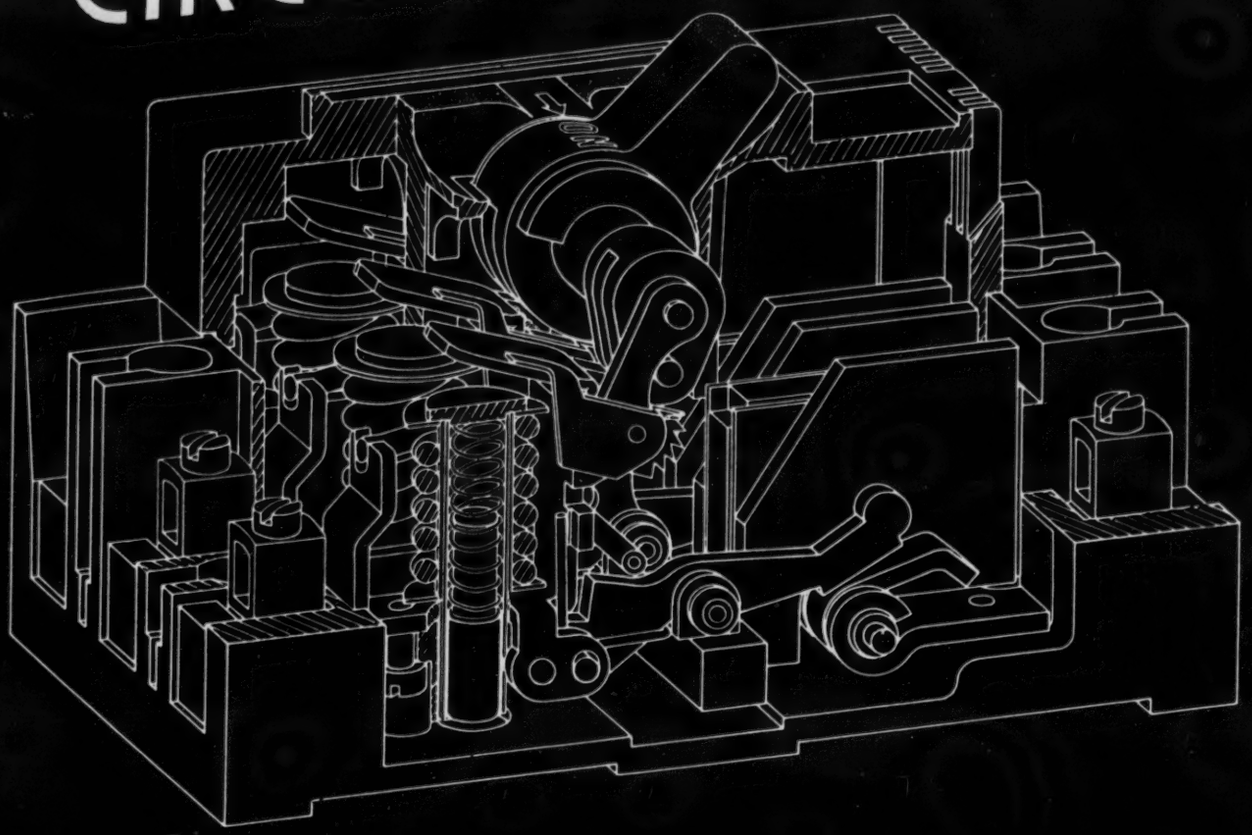
Inspection—Total Man-hours - - - - _____ Cost Labor - - - - - - - - $ _____

Replacement—" " - - - - _____ Cost Labor - - - - - - - - $ _____

Foreman _____

TOWER maintenance report and record form

FLEXIBLE but UNFAILING CIRCUIT PROTECTION



HEINEMANN

MAGNETIC CIRCUIT BREAKERS

Drawing shows cross section of time delay type breaker, designed to prevent nuisance trips on transient overloads and starting surges, while opening rapidly on sustaining and heavy overloads and instantaneously on short circuits. Same breaker can be made without the time delay arrangement as straight instantaneous trip type. Magnetic blowout provides high and fast interrupting capacity.

HEINEMANN CIRCUIT BREAKER CO.

Subsidiary of Heinemann Electric Co., Est. 1888

TRENTON • NEW JERSEY

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to STRENGTHEN
LIGHTEN WEIGHT
ABSORB VIBRATION
PREVENT CORROSION
INCREASE EFFICIENCY
SPEED UP PRODUCTION
INSULATE ELECTRICALLY

C-D laboratory research is not a product of the present emergency — this service was established and used extensively by our customers as early as 1914—today it offers you a wealth of experience gained in solving thousands of material problems. Use it as though it were a division of your own company.

HOW TO USE THIS CHART

C-D products are indicated

D for Dilecto . . . M for Micabond
F for Vulcanized Fibre . . . V for Vulcoid
THEY ARE ARRANGED FROM UPPER LEFT TO LOWER RIGHT in order of their suitability for problems involving two known requirements . . .

PRIMARY REQUIREMENT ↓	SECONDARY REQUIREMENT →	DIELECTRIC STRENGTH	POWER FACTOR	DIELECTRIC LOSS FACTOR	DIELECTRIC CONSTANT	ARC RESISTANCE	FLEXURAL STRENGTH	TENSILE STRENGTH	COMPRESSIVE STRENGTH	HEAT RESISTANCE	DIMENSIONAL STABILITY	MOISTURE RESISTANCE	OIL RESISTANCE	CHEMICAL RESISTANCE
DIELECTRIC STRENGTH		D M V F	M D V F	M D V F	M D V F	F V M D	D V F M	D F V M	D V F M	M D V F	D V M F	D V M	D V F M	D V
POWER FACTOR		M D V F	M D V F	M D V F	M D V F	M V D F	D M F V	D M F V	D M V F	M D V F	D M V F	M D V	D M V F	D
DIELECTRIC LOSS FACTOR		M D	M D V F	M D V F	M D V F	F V M D	F V D M	F V D M	D V F M	M D V F	D V M F	D V M	D M V F	D
DIELECTRIC CONSTANT		M D V F	M D V F	M D V F	M D V F	M V D F	D M V F	D M V F	D M V F	M D V F	M D V F	D M V	D M V F	D
ARC RESISTANCE		F V M D	F V M D	F V M D	V F M D	F V M D	F V D M	F V D M	F V D M	M V F D	V F M D	V M D	V F D M	V
FLEXURAL STRENGTH		V F D M	D F V M	D F V M	F V D M	F V M D	F V D	F V D	F D V	F V D M	V F D	D V M	D V F	D
TENSILE STRENGTH		V F D M	D F V M	D F V M	F V D M	F V M D	F V D	F V D	F V D	F V D M	V F D	D V M	D V F	D
ANCE														
DIMENSIONAL STABILITY		D V M F	D M V F	D V M F	D V M F	D V F M	D							
MOISTURE RESISTANCE		D V M	D V M	D V M	D V M	D V M	D							
OIL RESISTANCE		D V F M	D V F M	D V F M	D V F M	V F D M								
CHEMICAL		D V	D V	D V	D	V								

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HOW TO CONNECT

UNDERGROUND SERVICE CONDUITS

(COMPOSITION TO METAL)

By I. C. DIETZE
Engineer
Bureau of Power and Light
City of Los Angeles

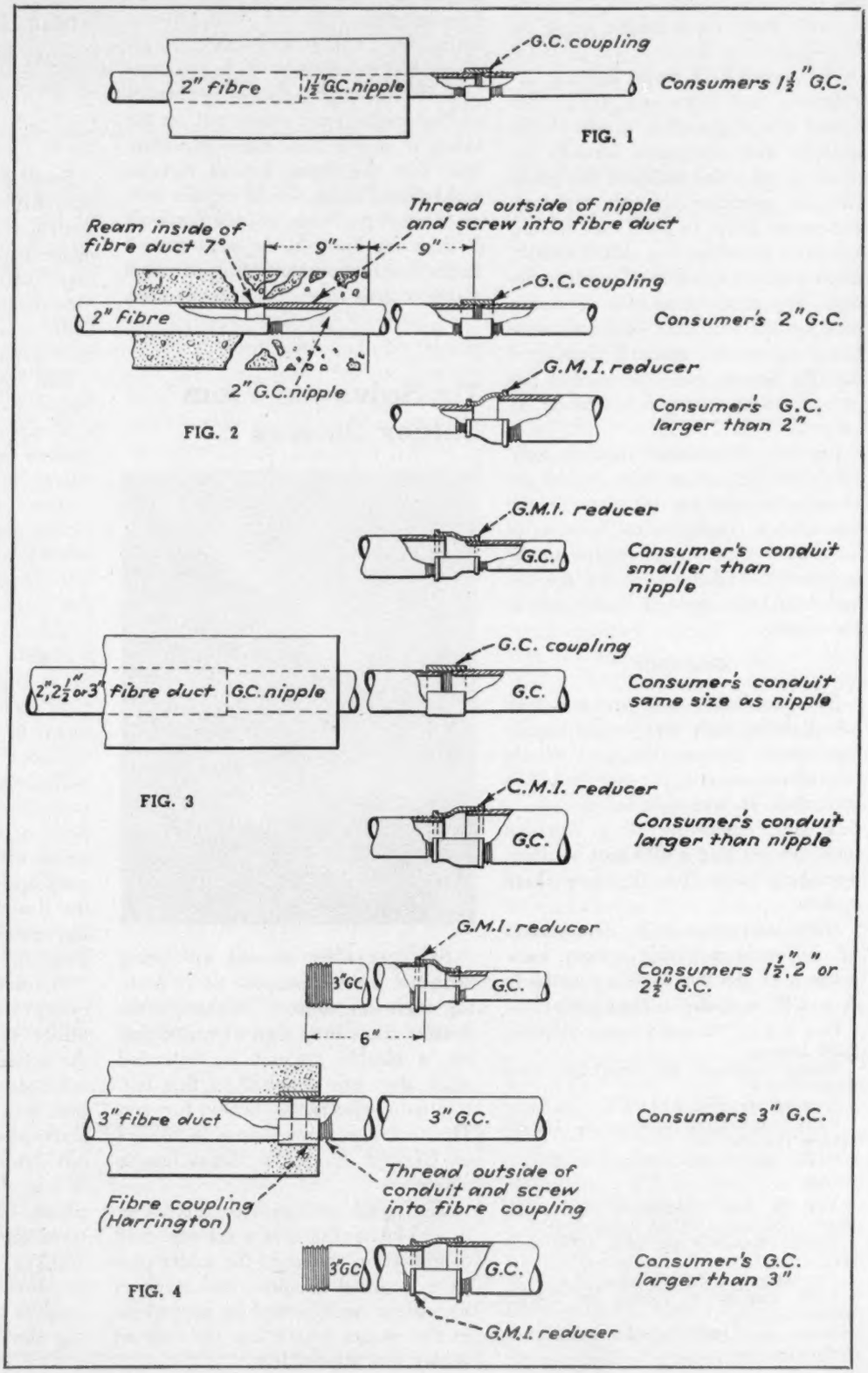
Various methods are presented for connecting utility's fibre duct to consumer's galvanized conduit which are of the same or smaller or larger sizes. Joints are made by galvanized conduit (G.C.) or fibre couplings or gavanized malleable iron (G.M.I.) reducers.

FIG. 1—Method of connecting consumer's galvanized conduit to utility's 2-in. fibre service duct which terminates in a 1½-in. G.C. nipple.

FIG. 2—When consumer's conduit is 2 in. or larger, the 1½-in. G.C. nipple on the utility's duct must be removed and a 2-in. x 18-in. G.C. nipple installed as shown. The duct-nipple joint is covered with concrete after approval by an inspector.

FIG. 3—Method of connecting consumer's galvanized conduit to utility's 2-, 2½- or 3-in. fibre service duct which terminates in a G.C. nipple.

FIG. 4—Method of connecting consumer's galvanized conduit, sizes 1½ in. and larger, to utility's 3-in. fibre service duct which terminates in a fibre coupling.



Forced Change Uses Less Copper

By E. R. BONDS
Robert & Company, Inc., Atlanta, Ga.

What with the materials scarcities and the consequent priorities of today, satisfactory solutions to engineering problems often depend on fast footwork, on the ability to shift quickly. Such an occasion arose in connection with a recent job of Robert & Company. A large lighting installation had been completely designed and engineered, much of the material and equipment already secured or priorities obtained for them. The job specified 110-volt, 100-watt fluorescent lamps in pairs with tulamp ballasts, operation on 110-220-volt, single-phase, a good solid modern design. Procurement of the necessary wire was all set, other essentials were lining up nicely, when it developed that the lamps themselves could not be secured at the time and place required.

Smaller fluorescent lamps were available, but to use them would obviously require an increase in the amount of copper wire because of the larger number of lamps to be connected. And the wire for the job had been allocated; it could not be increased.

Dual Unit

The problem was to find a substitute lighting unit that would supply equivalent illumination and would require no more copper than had been provided. It was decided to use a dual unit consisting of a 750-watt incandescent and a 400-watt mercury operating on a 220-volt, three-phase system.

Since amperage is the determinant of copper in a wiring system, comparison of the two lighting methods, A and B, is made on that basis:

Unit A, twin 100-watt F lamps, 110 volts, 8,400 lumens.
Energy required per unit, 235 watts total.
Current per unit, 2.14 amp.
0.253 amp./1,000 lumens in 110-volt branch circuits.
0.127 amp./1,000 lumens in 220-volt mains.

Unit B, dual 750-watt I, 400-watt M lamps, 220 volts, 29,500 lumens.
Energy required per unit, 1,200 watts total.
Current per unit, 5.45 amp.
0.185 amp./1,000 lumens in 220-volt branch circuits.
0.107 amp./1,000 lumens in 220-volt, 3-phase mains.

For the same light ten Unit B are equal to 35 Unit A. Thus, the job would require only 28.5 percent in number of Unit B as against Unit A. Use of Unit B would require only seven branch circuits to every ten for Unit A, assuming equal currents in conductors. And, on that basis of equal currents, about eight runs of 220-volt 3-phase mains would be required by the use of Unit B as against ten runs of 110-220-volt mains for Unit A. Even though, on account of the differences in spacings of units, the lengths of branch circuits and of mains runs would not be the same, it was a reasonable presumption that the fewer branch circuits and runs of mains would require less, or at most no more, copper for Unit B than for Unit A. As a matter of fact, the actual amount of copper used was less than was originally planned.

•

Tin Salvaged From Solder Drosses

Salvage solder drosses are being remelted for the purpose of reclaiming their tin content. Although the drosses show little sign of containing tin, a sizable amount is reclaimed when they are remelted in this bottom pour, electrically heated furnace. The reclaiming procedure is in one of General Electric's Massachusetts plants.

The metal reclaimed in the 1,200-lb., 15-kw. furnace is a tin and lead combination. Some of the solder pigs were returned to authorized smelters and some were reused in operations in the plants where low tin content solder was allowable.

Because of the present scarcity of tin, solder, which formerly consisted of approximately equal parts of tin and lead, has now been replaced by compositions containing no more than 30 percent tin and in many instances by alloys of about 80 percent lead, or even of lower tin content.

•

Pre-Empting Relays Limit Welder Load

By L. H. CHURCH
Hill & Knowlton, Cleveland, Ohio

Small magnetic relays, costing less than $10 each, installed in the pilot control circuits of a group of single-phase resistance butt welders in the plant of the American Welding & Manufacturing Company at Warren, Ohio, saved $50,000 which might have been spent otherwise.

Six 750-kva. welders were to be added to four others totaling 800 kva. already installed. Company engineers considered two proposals for energy supply from the utility 23-kv. system. One was three 1,500-kva. transformers in delta; the other, two 2,000-kva., three-phase in parallel. But the utility liked neither alternative because both raised a difficult problem of voltage fluctuation. Installation of another very large welder in a neighboring plant at the same time was an additional complicating factor in the matter of voltage maintenance. Therefore the utility suggested a three- to single-phase motor-generator as the best solution from its point of view. No one of these proposals satisfied both the welding company and the utility and all three had the drawback of difficulty in obtaining necessary materials and equipment.

A joint restudy of the welder duty cycles was made by company and utility engineers. They agreed that the actual load of the welders would not normally go over 2,000 kva., and that this load, properly balanced on three phases, could be carried without intolerable voltage disturbance. It was decided to install one three-phase, 23,000/440-volt, 2,000-kva. transformer, to connect two of the 750-kva. welders to each phase and to provide means to prevent the two welders of a phase pair from operating simultaneously.

The welders are automatically timed. A "start" push button initi-

AUXILIARY AXLE converts H. C. digger rack into drive for power take-up reel

ates the operation, which is carried through by a motor-operated cam device. In the control box of each welder a small, low-cost relay of the normally closed type was set. The contacts of the relay were connected in series with the "start" button of the welder. The coil of the relay was connected to the timing control circuit of the other welder of the phase pair. Thus when one welder is in operation the "start" circuit of the other is held open.

This simple interlocking scheme fits in well with the normal routine of operation, one welder working while the other is making ready. It has not caused any perceptible decrease in production. It has kept down the cost of electricity by maintaining maximum demand at half or less of the combined rating of the welders and has minimized voltage disturbance on the supply system.

•

Digger Rack Bar Drives Take-Up Reel

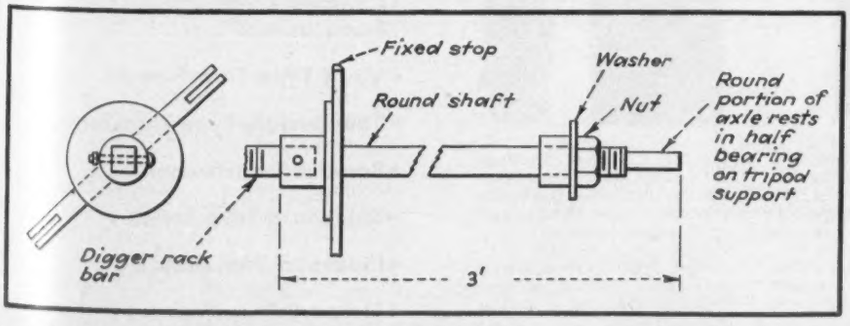
A scheme for using a conventional, truck-mounted, type H.C. digger unit and rack bar as the drive for a power take-up reel has been developed and used for some time by construction men of the Wisconsin Power & Light Company. When arranged in the manner to be described, the machine is said to be capable of handling reels of wire carrying up to about 5,000 ft. of 266,000-cir.mil ACSR cable.

When using the digger as a take-up reel drive, the rack bar is operated in a horizontal position, with the auger removed. An extension to the rack bar, built for the purpose, is slipped on in place of the auger. This extension is a round shaft about 3 ft. long which becomes the axle on which the reel is suspended and which turns the reel. The extension has a square socket to fit the end of the rack bar, which is held in place by a through-bolt.

The empty reel is slipped on the axle and pushed up against a stop fitted with slots which receive the heads of bolts that hold the reel together. On the outside of the reel another stop is slipped on the axle and held in place by a large nut which fits on a threaded portion of the axle, which has been turned down at this point. The outer end of the axle is a round shaft, slightly smaller in diameter than the threaded portion referred to. This portion of the shaft rides in a half-bearing supported on a tripod which stands on the ground. Arrangement is shown in the accompanying illustration.

A winch line from the truck boom is used to hold the reel while the shaft is being disconnected from the rack bar and the reel changed.

The original suggestion for using a digger in this manner was made by Clayton Russel, line foreman. George Behrendt and Victor Christensen, machinist at Prairie du Sac plant, assisted in the design and built the accessories for the outfit.



DETAIL of extension that converts digger into power take-up reel

•

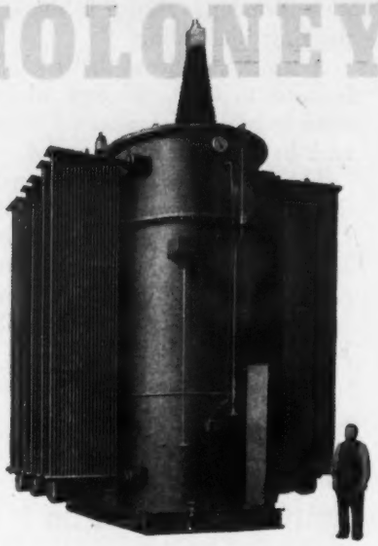
Experience in British Grid Plants

Conditions affecting the British generating stations are continually altering and a recent inference is that additional large high-efficiency stations may have to join others which do not run on the night shift. It also appears to R. A. W. Connor in a recent I.E.E. paper ("The Effect of the National Grid on the Operation and Maintenance of Secondary Power Stations") that the majority of new stations will be designed for basic efficiencies between 25 and 28 percent on kilowatt-hours sent out. "These stations will eventually become so numerous that a number of them will not be needed at periods of light load." Improvements in operating technique and careful load allocations have resulted in less difference between the most and least efficient stations. Future load factors and load curves are expected to accentuate the trend.

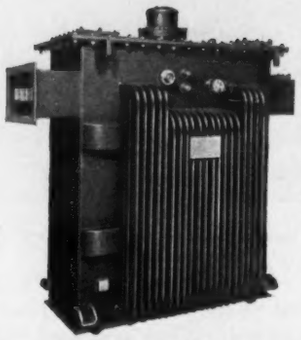
In a typical 50-mw. station with chain grates it is found that the rate of completing load changes of from 0 to 10 mw. is usually from 1 to 2 mw. per minute, whereas changes from 10 to 30 mw. usually proceed at an average rate of 0.5 to 1 mw. per minute.

Grid operation has not resulted in any appreciable staff reductions in stations with ratings from 10 to 200 mw. An average curve of kilowatts per man for stations up to 80 mw. shows about 800 kw. per man for 80 mw., 600 for 50 mw. and 300 for 20 mw. These figures include all staff and workmen engaged in generation. The variations for individual stations depend on such widely different items as climate, sickness rate, local politics, plant terminal conditions, hours of banking and age of plant.

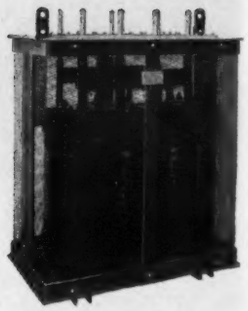
MOLONEY TRANSFORMERS



Moloney Power Transformer. Transformer pictured above is rated 25,000 Kva, 161,000Y to 13,200 volts. These transformers can be supplied in any capacity or voltage desired.



Moloney Askarel (non-inflammable liquid cooled) Transformer. For indoor installation at load centers without the use of fire-proof vaults. Available in all Kva and voltage ratings.



Moloney Air-Cooled Transformer with Class B insulation. For indoor installation at load centers without the use of fire-proof vaults. Available in voltages up to 13,800 volts and in capacities of 150 Kva and larger.

One of these MOLONEY transformers will meet your requirements . . .

Moloney manufactures transformers for all types of installations. If transformers of standard design do not fill your needs, our experienced engineering staff can design transformers which will exactly fit your requirements.

Disconnect switches, oil-fused cutouts, terminal boxes with potheads, forced-air-cooling, secondary air circuit breakers and many other features can be supplied on Moloney transformers.

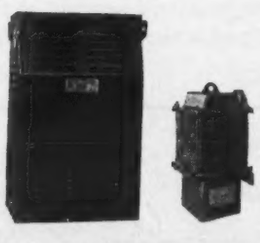
Quick shipment can be effected whether the transformers are of standard or special design. Your inquiries will be given prompt attention.

MOLONEY ELECTRIC COMPANY

ST. LOUIS, U. S. A.

Moloney Conventional Distribution Transformer, oil-cooled, for outdoor pole or platform mounting. Sizes 1½ Kva to 500 Kva. Voltages up to 66,000 volts. Illustration typical of sizes 75 and 100 Kva, 7200 to 120/240 volts.

Moloney Completely Self-Protected Transformer, oil-cooled, equipped with built-in lightning and secondary overload protection. Sizes 1½ to 50 Kva. Voltages 2400 to 13,800 volts. Illustration typical of sizes 1½ to 25 Kva, 7200 to 120/240 volts.



Moloney General Purpose Air-Cooled Transformers with Class A insulation. For industrial use to serve lighting and small power loads. Left illustration typical of sizes 15 to 50 Kva. Right illustration typical of sizes 1 Kva to 10 Kva. Voltages 600, 480 or 240 to 120/240 volts.

Moloney Transformers for every purpose

- Power Transformers
- Unit Substations
- Conventional Distribution Transformers
- Completely Self-Protected (CSP) Transformers
- Load Center Transformers
- Askarel (non-inflammable liquid) Cooled Transformers
- Air-cooled (Class A and Class B insulated) Transformers
- Constant Current Street Lighting Transformers
- Vault Type Transformers
- Submersible Type Transformers
- Furnace Transformers
- Shipboard Transformers
- Industrial Transformers
- Network Transformers

HOW TO DETERMINE

SAFE LOADS FOR MANILA ROPE SLINGS

Type of manila rope sling generally used as a hook spliced at one end of a length of high-grade manila rope and a ring or hook at the other end. Accompanying information and data are adapted from Industrial Data Sheet D-Gen. 3 issued by the National Safety Council, Inc., Chicago, Ill.

When manila rope slings are used the following factors should be given careful consideration:

1. Before attempting to lift a load with a manila rope sling care must be taken to make sure that the sling is in proper condition and of sufficient strength to lift the load. This means that the hooks, rings and other fittings must be properly spliced to the sling legs (see Note 2). It also means that the weight of the load to be lifted must be carefully estimated, and the proper sized slings used (see table).

2. It should be remembered that a greater load can be safely lifted when all legs of the sling are in a vertical position. On the other hand, the smaller the angle formed between the legs of the sling and the horizontal the greater the tension on the sling's legs and the less the weight which may be lifted safely (see table).

3. All users of manila rope slings should be carefully instructed regarding the safe loads for slings under various conditions, and copies of accompanying table showing such loads should be posted in conspicuous places about the shop.

4. If three-leg slings are used safe loads given in the table for double (two-leg) slings may be increased 50 percent and four-leg slings 100 percent; *i.e.*, the safe load for a new 1-in. three-leg sling at 60 deg. with the horizontal is 4,200 pounds, and for a new four-leg sling of same size and angle, 5,600 pounds.

5. When a rope sling has been in use for six months or longer, even though it shows no sign of wear or other damage, the loads placed upon it should be limited to one-half those given in the table.

Manila rope slings deteriorate very quickly if they become wet and are not properly dried out. Whenever they have become wet or dirty, they should be cleaned and hung up, so that they may become thoroughly dry. They should not be thrown into a corner or covered with material so that the air cannot circulate through them. Slings should not be stored in a damp place as rot may result. On the other hand, if stored in too dry or too warm a location, the rope fibres will become brittle and lose much of their strength. Rope slings should not be allowed to freeze after becoming wet, as frozen rope breaks easily. Frozen rope slings should not be piled against radiators, steam pipes, or other sources of heat, as this will tend to dry out the oil in the rope and destroy the life of the rope fibres.

Safe Loads for New, Standard, Medium-Lay, Three-Strand, Manila Rope Slings, Spliced for Hook at One End and Hook or Ring at the Other End

Approximate Diameter of Rope, Inches	Safe Loads, Pounds			
	Single-Leg Vertical Sling	Double (Two-Leg) Sling Degree of Angle with Horizontal		
		60 Deg.	45 Deg.	30 Deg.
3/16 (6 yarns)	80	135	110	80
1/4 (6 yarns)	105	180	150	105
5/16 (9 yarns)	180	310	250	180
3/8 (12 yarns)	240	415	340	240
7/16 (15 yarns)	315	550	450	315
1/2 (21 yarns)	475	820	670	475
9/16	620	1075	875	620
11/16	790	1370	1115	790
3/4	970	1675	1375	970
13/16	1170	2025	1650	1170
15/16	1385	2400	1960	1385
1	1620	2800	2290	1620
1 1/16	1890	3275	2675	1890
1 3/16	2160	3740	3050	2160
1 1/4	2430	4200	3435	2430
1 5/16	2700	4675	3820	2700
1 1/2	3330	5765	4700	3330
1 5/8	4050	7000	5725	4050
1 13/16	4770	8260	6750	4770
2	5580	9665	7900	5580
2 1/4	7380	12775	10435	7380
2 5/8	9360	16200	13235	9360
3	11520	19950	16300	11520
3 1/4	13860	24000	19600	13860
3 5/8	16380	28375	23150	16380
4	18900	32725	26725	18900

Manila rope slings should not be used:

1. For lifting molten metal or other loads where the rope will be subjected to unusually high temperatures. To do so may char the rope or do invisible damage which may cause the sling to fail under load.

2. If the load to be lifted has sharp corners, unless corner pads are placed between the load and the rope to prevent cutting the rope fibres.

3. To lift a load where there will be sharp bends of rope over an unyielding surface, as these bends cause extreme tension of the outside rope fibres, which may seriously injure the rope.

4. If the rope shows evidence of cuts, excessive wear, or other damage. Such a rope sling should be promptly discarded and destroyed, as its use will ultimately result in a serious injury to some one, or in damage to property.

5. If there is danger of getting acid or strong alkali on the rope, as such chemicals cause immediate damages to fibres, making the rope absolutely unsafe for further service.

NOTE 1—Safe loads given in the table are based on a factor of safety of five. The minimum breaking strengths used in the computation of the table have been taken from the United States Federal Specifications for Rope, Manila T-R 601, promulgated on March 7, 1933, by the Federal Specifications Board, United States Bureau of Standards, Washington, D. C. The maximum strength of the splices necessary for hook at one end of the sling and a hook or ring at the other end has been taken as 90 percent of the minimum breaking strengths of the ropes.

NOTE 2—For further details on rope slings, splicing of the attachments to the slings, the selection of rope for the slings and their care, see National Safety Council Safe Practices Pamphlet No. 6, "Fiber Rope."

Series Capacitors—Where Place? How Big?

Gradient Determination*—VI

By S. LUBIN
Engineer, REA Technical Standards Division

Referring to Fig. 1 of the third installment:

Assume the location of the capacitor at point E, with full load power factor of 75 percent and light load power factor of 90 percent.

Then: $K_L = 145$ kva.
θ = arc cos 0.75 = 41.4 deg.
Sin $\theta = 0.66$
$V = 10\%$
θ_N = arc cos 0.9 = 25.8 deg.
Sin $\theta_N = 0.44$
$E = 7.2$ kilovolts
$K_{LN} = 30$ kva.

$$X_C = \frac{10\,E^2 V}{K_L \sin\theta} = \frac{10 \times 7.2^2 \times 10}{145 \times 0.66}$$

$= 54$ ohms

$$V_N = \frac{K_{LN}\, X_C \sin\theta_N}{10\,E^2} = \frac{30 \times 54 \times 0.44}{10 \times 7.2^2}$$

$= 1.4\%$

Thus in order to provide the desired voltage rise at full load, for the tap EK (Fig. 1) it will be necessary to install a single-phase capacitor at E having a 60-cycle reactance of 54 ohms. If voltage correction is necessary on the two-phase tap from E, the size of the required capacitors may be calculated in the same manner.

The voltage gradient can now be represented by Fig. 1 and examination shows that maximum variation at any point on the line is 10 percent. The choice of location is therefore in order.

But a location closer to the course such as at B or C may have provided better regulation along the whole system. Fig. 2 illustrates the effect of placing the capacitor at C.

Calculation for the single-phase extending from A to K:

Distributed full load between C and K = $2 \times 44 = 88$ kva.
Taps D and E (full load) = $\frac{1}{3} \times 100 + \frac{1}{2} \times 75 = 71$ kva.
Taps F, G, H, K — single phase (full load) = 85 kva.
$K_L = 88 + 71 + 85 = 244$ kva.
$\theta = 41.4$ deg.
Sin $\theta = 0.66$
$V = 10\%$
$\theta_N = 25.8$ deg.
Sin $\theta = 0.44$
$E = 7.2$ kilovolts
Distributed light load between C and K = $\frac{1}{2} \times 44 = 22$ kva.
Taps D and E (light load) = $\frac{1}{3} \times 25 + \frac{1}{2} \times 15 = 16$ kva.
Taps F, G, H, K — single phase (light load) = 15 kva.
$K_{LN} = 22 + 16 + 15 = 53$ kva.

$$X_C = \frac{10\,E^2 V}{K_L \sin\theta} = \frac{10 \times 7.2^2 \times 10}{244 \times 0.66}$$

$= 32.4$ ohms

$$V_N = \frac{K_{LN} X_C \sin\theta_N}{10\,E^2} = \frac{53 \times 32.4 \times 0.44}{10 \times 7.2^2}$$

$= 1.5\%$

However, it should be noted that this better regulation is obtained at an increase in capacitor cost, and unless the loads between the substation and point E require this closer regulation the additional cost would be unwarranted.

Since the reactance of a capacitor is given by:

$$X_C = \frac{1}{2\pi f C} \qquad (3)$$

where: f = frequency in cycles
C = capacity in farads

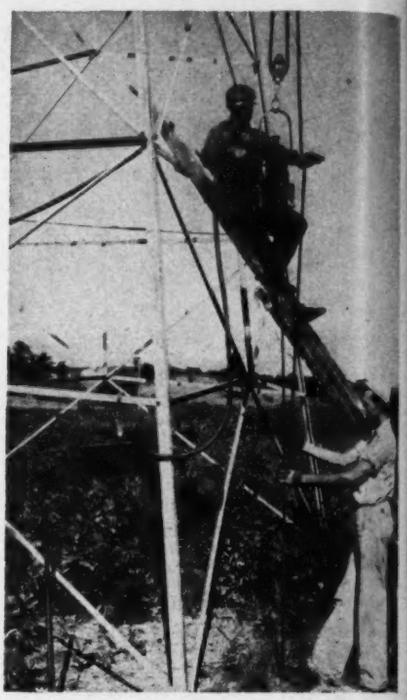
then: $$C = \frac{1}{2\pi f X_C} \qquad (4)$$

and the capacitance needed for 32.4 ohms reactance at point C is approximately twice that required for 54 ohms (the reactance required for installation at E).

*This series began in the April 17, 1943, issue of "Electrical World."

Method for Driving Ground Rods*

By W. C. SCHMIDT
Commonwealth & Southern Corporation, Jackson, Mich.



GROUND-ROD is driven by a Barco gasoline hammer

For earth connections at various places along our transmission lines ground rods are installed at tower bases. Sectionalized rods have been designed (see ELECTRICAL WORLD, June 12 issue, page 124) and are driven by means of a Barco gasoline hammer. The method for driving the rods is essentially the same for wood-pole lines such as outlined in "Struc-

*Excerpt from paper presented at recent E.E.I. transmission and distribution committee meeting in Pittsburgh.

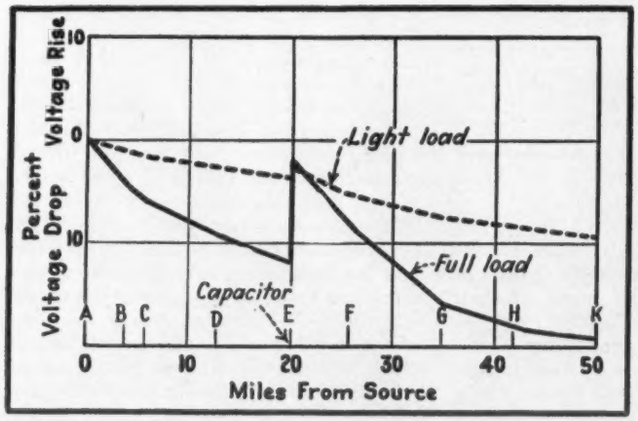


FIG. 1—Series capacitor at E gives maximum voltage variation of 10 percent at any point on the line for either light load or full load

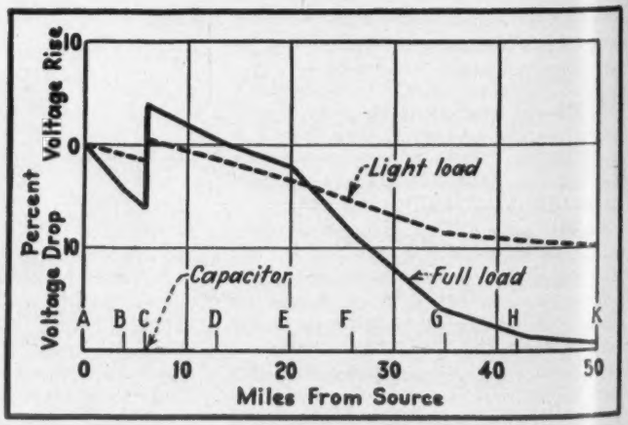


FIG. 2—Installation at C superior to location at E because maximum regulation is still only 10 percent, but it is only 5 percent between C and E instead of 9 percent

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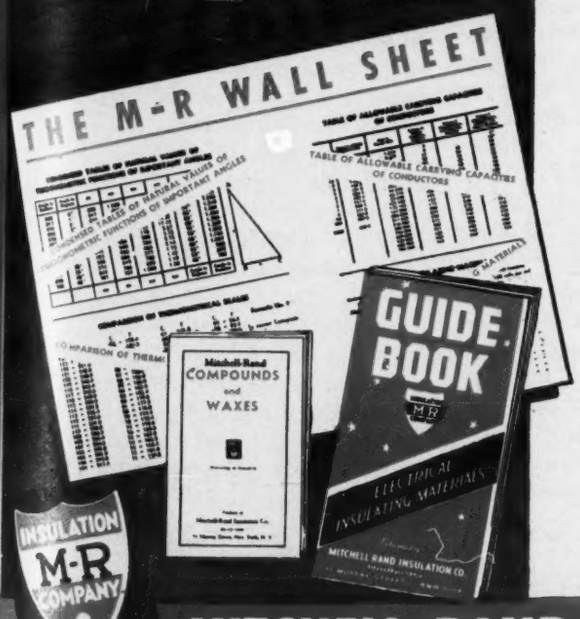

WE'LL MEET THEM!

Mitchell-Rand the "Insulation Headquarters" is a title well earned . . . the result of 54 years service to the Electrical and Electronic Industries during which time countless formulas for Waxes and Compounds, Varnished Tubings, Insulating Varnishes, etc., were developed for the expanding services required of electrical insulations.

Today as always M-R Electrical Insulations take the cares out of your insulation problems . . . You name your requirements and M-R will meet them.

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Write today for your Free Card of Varnished Tubing with samples ranging from size 0 to 20 to fit wires from .032 to .325 inches . . . other valuable aids, are the M-R Guide Book of Electrical Insulation . . . the Wall Chart with reference tables, electrical symbols, allowable capacities of conductors, dieletric averages, thicknesses of insulating materials and tap drill sizes . . . and the M-R Wax and Compound Guide Book . . . they are full of valuable information . . .

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Transformer Compounds

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Impregnated Varnish Tubing
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Varnished Cambric Cloth and Tape
Mica Plate, Tape, Paper, Cloth and Tubing

tural Data for 138-Kv. H-Frame Lines" in ELECTRICAL WORLD, April 3, 1943 issue, page 50.

Ground rods are driven to a sufficient depth so that a maximum of 10 ohms of resistance to ground is obtained. This requires on certain lines in our territory an average length of about 60 ft., although individual rods have been driven as deep as 175 to 200 ft.

Occasionally because of the character of the soil or because of rock strata near the surface it is impossible to obtain proper resistance with ground rods. A single, continuous counterpoise using No. 4 W & M gauge (0.2253 in. diameter) solid, zinc-coated steel wire is then installed. This wire, like the steel overhead ground wires now installed, is coated with the A.S.T.M. C-weight of coating.

•

Filter Bans 25-Cycle From Ground Relay

By R. B. SQUIRES
Switchgear Engineer Westinghouse Electric & Manufacturing Company, East Pittsburgh

An unusual relay problem of inductive interference has been solved by filtering out the disturbing currents. An important double-circuit 69-kv. transmission line that connects two parts of its system is adjacent to the 25-cycle circuits of an electrified railroad. Spacing between the railroad circuits and the 60-cycle transmission line is close enough to induce an appreciable voltage in the transmission line whenever there is a fault on the railroad circuits.

This induced voltage causes a 25-cycle current to circulate (Fig. 1) into the neutral of the transformer bank at one end, along the line and down into the neutral at the other end. The maximum 25-cycle induced current in the neutral of the 60-cycle power transformers can be as much as 500 amp. This is more than the current for a minimum ground fault on the 60-cycle system. It was impossible, therefore, to set the 60-cycle ground relays to protect for the minimum 60-cycle ground fault without having them operate falsely because of the induced 25-cycle currents.

This problem has been solved by the recent installation of a 25-cycle filter (Fig. 2) between the current transformers and the 60-cycle ground relays. The filter is essentially a four-branch bridge circuit, with the leads from the current transformer connected to two opposite corners of the bridge and the ground relay connected to the other two corners. In two of the branches of the bridge a resistor and reactor are connected in series and in the other two branches they are connected in parallel. The resistors and reactors are adjusted so that all four branches have the same impedance at 25 cycles. Consequently, all of the 25-cycle current is by-passed around the relay. However, at 60 cycles the impedance of the two series branches increases more than the impedance of the parallel branches, so that most of the 60-cycle current flows down through one parallel branch, across through the relay and out through the other parallel branch. In this way the relay receives enough 60-cycle current to cause it to operate when it should.

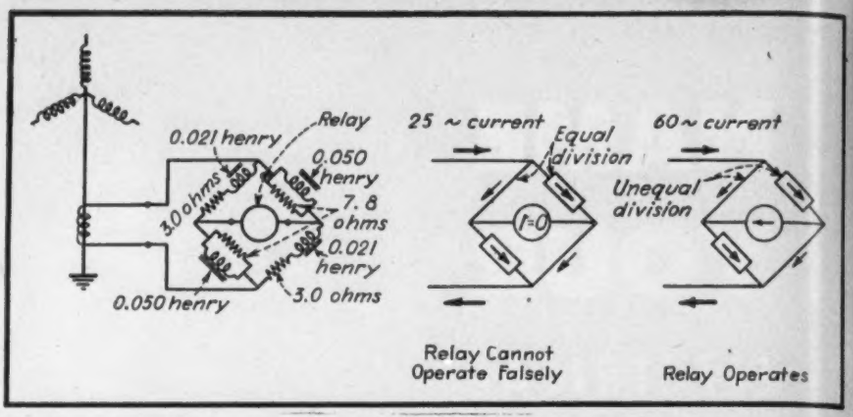


FIG. 2—Installation of a filter between the current transformer and the relay makes the 25-cycle induced currents flow around the relay, while the 60-cycle currents flow through it

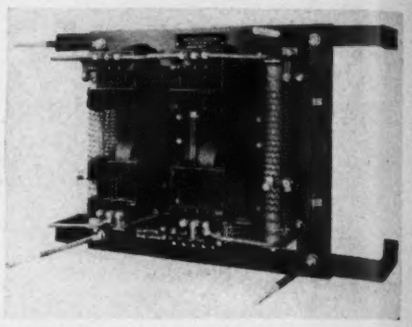


FIG. 3—25-cycle filter panel with its cover removed to show the four resistors and reactors

The filter panel, ready for mounting on the back of the relay switchboard, can be seen in Fig. 3. The metal cover has been removed to show the internal construction.

The filter (assembled on panel of Fig. 3) is applicable not only to interference between railroad and power lines but also to any case in which inductive interference between two grounded systems of different frequency causes false ground relay operation. For instance, if a three-phase, 60-cycle, solidly grounded transmission line is sufficiently close to a three-phase transmission line on a 25-cycle solidly grounded system, a ground fault on either the 25- or 60-cycle system can cause the relays on the other to operate falsely. Filters installed with the affected ground relays on both the 25- and 60-cycle systems will prevent the false relay operations in the same way they have prevented false operations on this utility system.

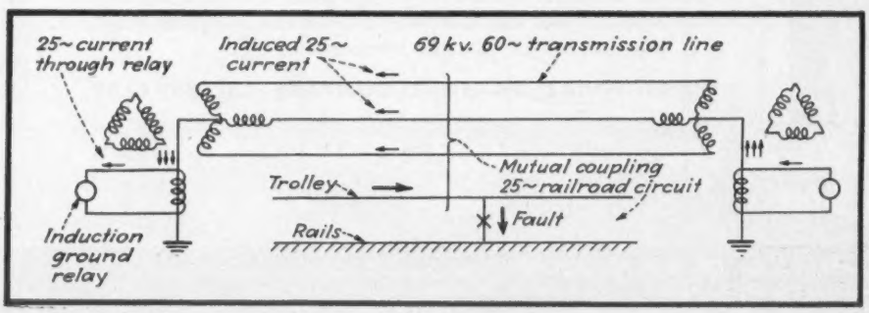
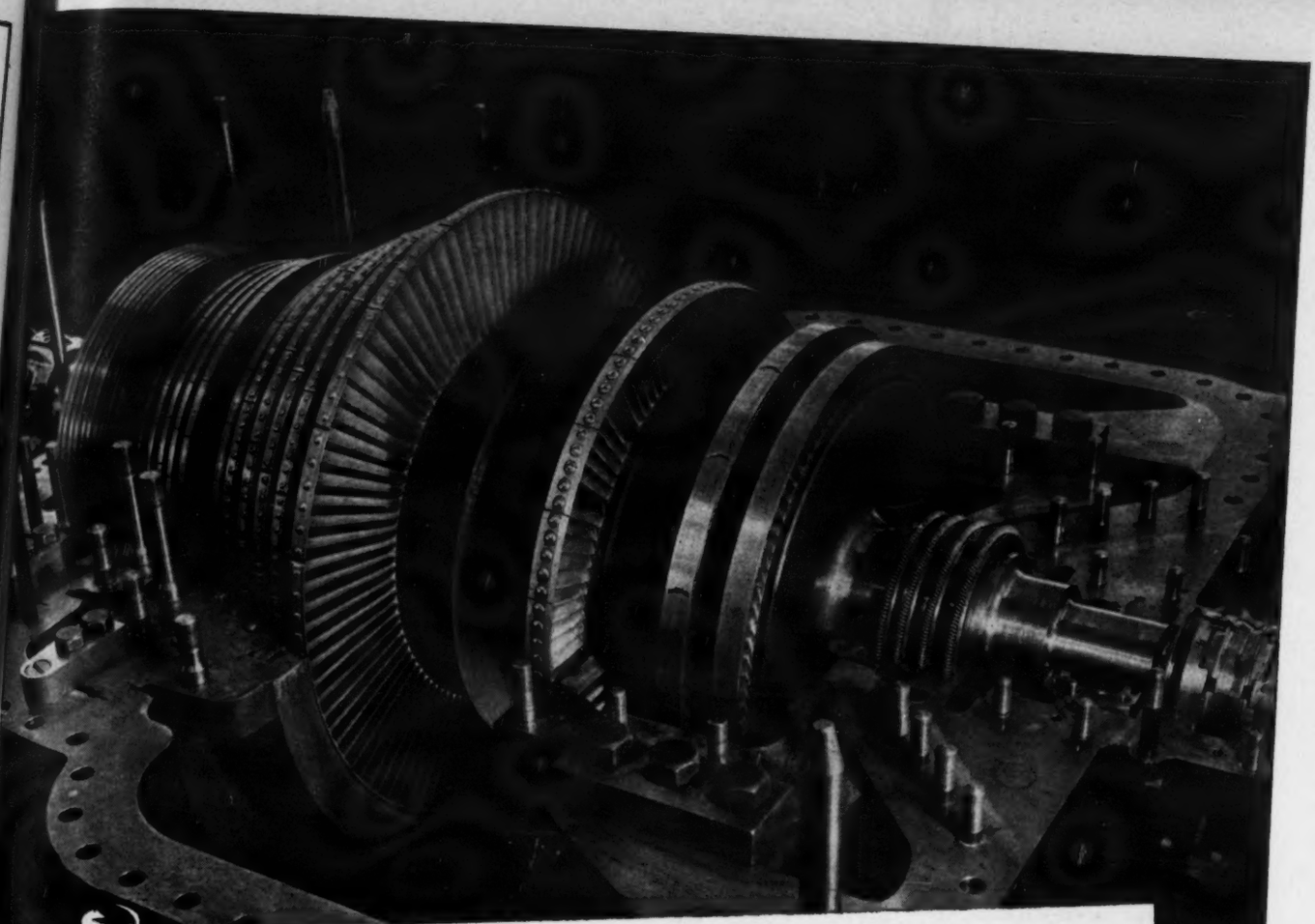


FIG. 1—Fault on electrified railroad caused 25-cycle currents to flow through the transformer neutrals and the ground relays of the 60-cycle system

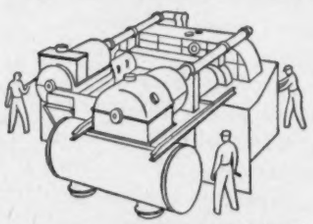


THE TURBINE IS THE HEART

Deep in the hulls of the big cargo ships are humming hearts of steel... bearing the Hendy name-plate. These turbines, developing thousands of horse-power, speed the guns, ammunition and supplies, on dependable schedules, to our multiple battle front.

To build these intricate power plants requires not only vast plant facilities, precise material control, precision tools and fabrication methods, but in addition, a group of highly skilled engineers, master craftsmen and production strategists.

Like the huge 2500 hp Hendy engines, which now power one-third of all Liberty ships, Hendy turbines are the heart of a vital military transport system that some day will be used to reconstruct a war-torn world.



Hendy has reduced the difficult job of building marine steam turbines and their reduction gears to a simple, straight-line production method which assures accuracy and economy with dependable delivery schedules.

Hendy has been awarded the Maritime M and the Army-Navy E...each with an extra Star for continued outstanding production.

JOSHUA HENDY IRON WORKS

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LOAD SERVICING

Industrial • Commercial • Rural • Residential

Off With the Apron, On With the Overalls

By GEORGE W. KERR
Ebasco Services Inc., New York

A worker in a war-work factory was talking to his "white-collar" friend. The factory man was telling of one of the jobs they do. Women assemble the parts of a certain piece of armament. They lay three or four small polished brass and copper plates one on top of the other. Then they drop screws in holes of the plates, put an electric screwdriver to each of the screws and the job is done. Nice, clean work for women.

"Electric screwdriver!" ejaculated the white-collar man, "why, I didn't know there was any such thing!" Why should he know? All through the years the electric utilities have been advertising what? Washers, irons, refrigerators, toasters, etc. All things used in people's homes. So, when people think of electricity they think of it in terms of things used around the house—not of the machines and machinery in the factory.

Now that they have to cut out advertising household appliances, what are the electric utilities to put in space which they shall continue to take in the newspapers? Pick up any magazine or newspaper—the pages are filled with advertisements of all kinds of businesses telling what their product is doing to help win the war.

These advertisers know what's uppermost in people's minds today. And they are tying in their business with it—building good will.

The electric utility people know this, but how many others know it?

People are still thinking of electricity in terms of irons, percolators and toasters, not of the huge, rough, tough, power job of running the machines and machinery in the factory. Isn't it about time for the utilities to "tell them different?"

Isn't the utilities' big story about the machines and machinery—run by electricity?

It would astound people to see a list of such machines and machinery. It would take about several full-page advertisements to print them all.

But a list could be made of the most important machines and machinery run by electricity in the factories in a utility's territory and this list made the basis of an advertisement.

•

Good Lighting Speeds Production of Parts

Evenly distributed, glareless illumination in one southern California plant manufacturing accessories for aircraft is furnished by 275 fluorescent lighting units. Each unit houses two 5-ft., 100-watt lamps. Intensity of illumination is approximately 40 foot-candles on working levels. Reflecting surfaces of the fixture are white porcelain and outside finish is gray. Control of the lamps by two-lamp ballasts in each fixture minimizes "flicker" or stroboscopic effect.

Fixtures are mounted on 10-ft. centers and approximately 11 ft. 9 in. above the floor. The new fluorescent installation supplanted an earlier one comprising 275 RLM-type reflectors housing 300-watt incandescent lamps and yielding 25 foot-candles of illumination. The Westinghouse fluorescent Mazda lamps and type 2-FPR-100 fluorescent luminaires were mounted on existing outlets by the Newberry Electric Company, Los Angeles electrical contractor.

•

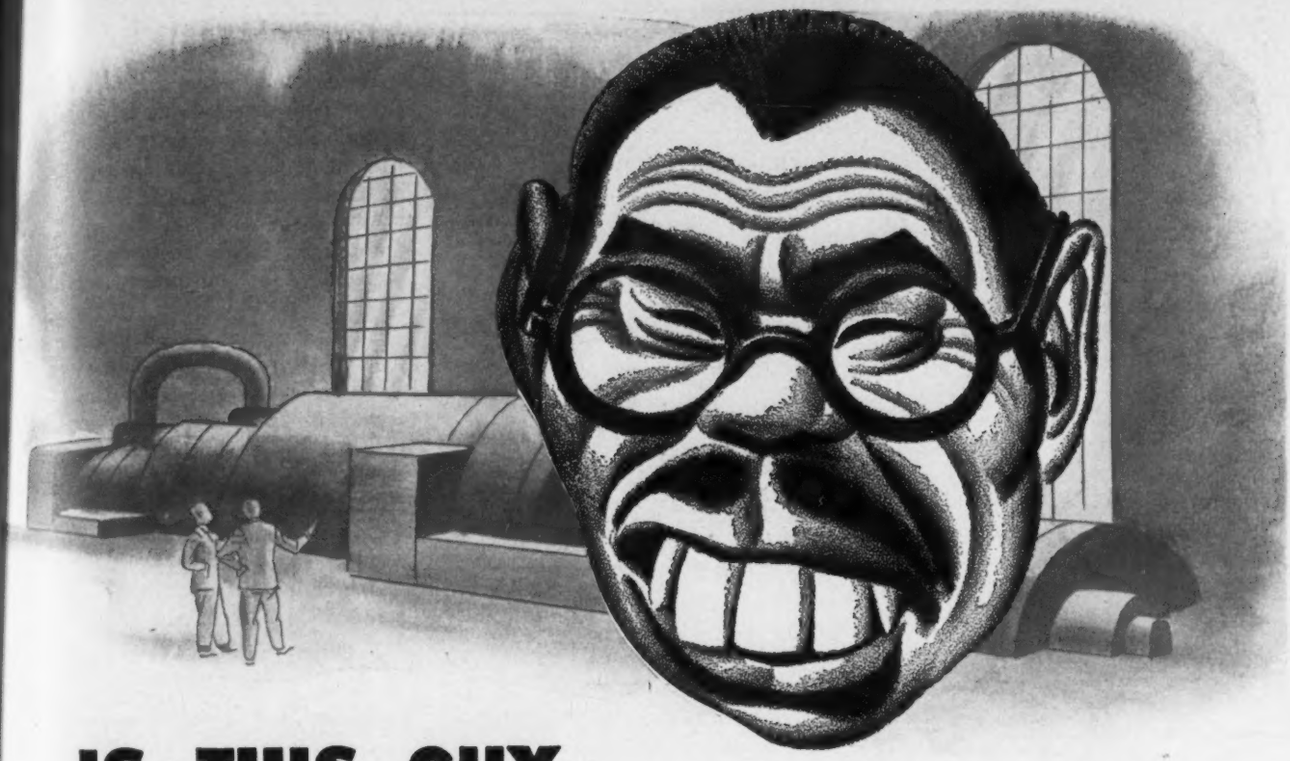
Electric Heat Saves on Boiler Cost

Electric heat has provided the answer to a problem at Haag Brothers, Inc., Hoboken, N. J. This company, engaged in the meat-packing business, recently installed an air-conditioned oven for smoking meat. Supplementary equipment was a smokehouse conditioner which furnishes smoke and properly heated and humidified air to the oven.

The conditioner ordinarily would have to be provided with 400 lb. of steam per hour at 50 lb. gage pressure to heat the air to a temperature of 240 F. as it circulates over an arrangement of finned steam coils.

It was found, however, that the existing structure was too small to accommodate a 50-lb. boiler, and

ADEQUATE LIGHT speeds production of airplane accessories



IS THIS GUY SMARTER THAN WE ARE?

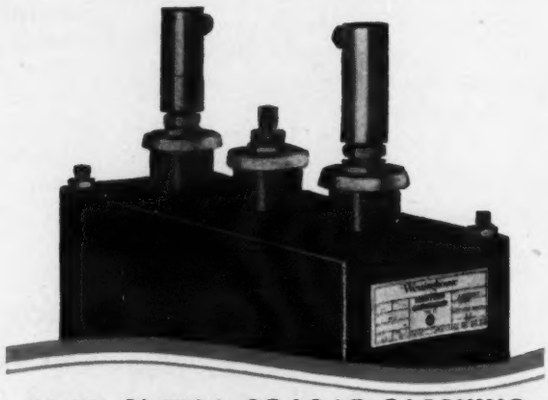
We'd hate to think so. But we *can* take a leaf from his book on "Making the Most of What We've Got."

Handicapped by limited generating capacity and equally limited supplies of critical materials for building new equipment, Tojo had to power a top-heavy war industry. How did he do it? One means was by the prolific use of capacitors. With them the Jap squeezes more Kv-a per unit out of his generating capacity than any other nation on earth.

Yet, according to conservative estimates, our own existing power systems can, by utilizing capacitors which reduce power losses, be made *to release up to 2,000,000 Kv-a for Victory.*

Westinghouse Inerteen Capacitors provide a quick and practical way to tap this huge reservoir of power by quickly relieving lines and equipment of the wattless current resulting from heavy inductive loads. Inerteen Capacitors can be easily installed on distribution circuits with but brief interruption of power. Write for latest literature on Inerteen Capacitors. Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa., Dept. 7-N.

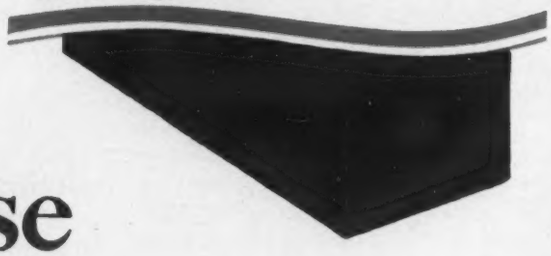
J-60535



⅓ TO ⅔ KV-A OF LOAD-CARRYING CAPACITY CAN BE RELIEVED BY EACH CAPACITOR KV-A INSTALLED

★ ★ ★

AN EXAMPLE: A utility reduced its load from 92,000 to 83,000 Kv-a by installing 15,000 Kv-a of capacitors—making 9,000 Kv-a *immediately* available for war production.



Westinghouse

PLANTS IN 25 CITIES... OFFICES EVERYWHERE

INERTEEN CAPACITORS

there was no room on the grounds for a new building. The only type of boiler which could be installed in the available space was a low-pressure sectional type of 15 lb. gage maximum.

At this pressure the smokehouse conditioner could heat air to only 200 F., insufficient to operate the oven properly. It was necessary, therefore, to boost the air temperature. Electric heat was called upon to do this, since a constant and quick heat supply was needed.

Eight General Electric finned Calrod heaters, with a total connected load of 48 kw., were installed in the circulating ducts through which the air passes from the conditioner to the oven. The heaters were installed immediately beyond the steam coils and were arranged with hand-controlled switches so that the operator can select the heat volume to satisfy any demand, depending upon the work being done in the oven.

The lower-pressure boiler is now doing the job as well as a 50-lb. boiler. In addition, the cost of operation is less than the estimated cost for the higher-pressure boiler. The oven and smokehouse conditioner were furnished by the Niagara Blower Company and the customer's engineer in charge of this application was O. Knipping.

•

Farm Test Proves Electricity Is Cheap

What electric labor can accomplish on the farm has been demonstrated over the past year on the dairy farm operated by Harry Stroven and son Stanley near Fremont, Mich., in the territory served by the Consumers Power Company, Jackson.

To obtain data on power use on the farm County Agent Clarence C. Mullett, co-operating with the Consumers Power Company, placed eight electric meters and two water meters on a number of pieces of equipment on the farm, using it for demonstration purposes.

These meters were installed more than a year ago and information summarized in the accompanying table shows the number of kilowatt-hours used and the cost of operating the various equipments for a full twelve-month period. Because of the large quantity of electricity consumed the average cost per kilowatt-hour is only 1.31 cents.

Electricity Is Cheap Help on Farm

	Avg. Kw.-Hr. Use per Mo.	Avg. Cost per Mo.	Work Accomplished
Water System.....	33	$0.43	17,161 gal. per mo., 517 gal. per kw.-hr.
Refrigerator.....	25	0.33	Household use
Poultry lighting.....	5	0.07	400 hens
Milking machine....	19	0.25	18 to 20 cows
Range.....	187	2.46	Household use
Walk-in milk cooler..	128	1.68	6,000 qts. per mo.
Dairy water heater..	586	7.71	2,626 gal. heated per mo.
Milk bottle washer, separator, house and barn lights and small household appliances	176	2.31	6,500 milk bottles washed per mo.
Total.....	1,159	$15.24	

As the table shows, the Strovens use electricity for a great variety of purposes. An electric milking machine milks 18 to 20 cows and the milk is cooled by electric aeration and placed in a large walk-in refrigerator. All water for sterilizing and washing bottles and cans is heated electrically and water for all purposes is pumped electrically.

Data on the Stroven farm operation was reported in the Muskegon *Chronicle* and subsequently in the Consumers Power Company house organ.

•

Quarterly Reading Common in Wisconsin

With few exceptions private utilities in Wisconsin have adopted a quarterly meter-reading program. A survey conducted by the Accounting-Procedure Committee, Accounting Section, Wisconsin Utilities Association, J. L. Anderson chairman, reveals the following information regarding member companies:

Customers Under Plan

Wisconsin Power & Light Company, Madison, has 21,000 rural and 15,000 urban customers under a quarterly reading plan.

Milwaukee Gas Light Company says 9,000, or 4½ percent of the total number of its customers, are under the plan.

Northern States Power Company reports 5 percent of all customer card read.

Wisconsin Electric Power Company, Milwaukee, has 23,000 customers under the plan. This is 97.8 percent of all rural or 8.4 percent of all customers.

Wisconsin-Michigan Power Company has 19,336 customers or 49 percent of all customers quarterly read.

Wisconsin Gas & Electric Company has two-thirds of all customers in the northern division on the quarterly program, also one-quarter of those in the western division.

Wisconsin Public Service Company has 21,744 customers under the quarterly plan or about 19 percent of all customers.

Mississippi Valley Public Service Company has 3,214 customers' meters read bi-monthly. This is 30 percent of their total customers.

Seasonal Cottage Customers

Six companies reported that seasonal cottage customers are under the quarterly reading program. Three of these six, however, read the cottage meters each month beginning with June and ending with September. One company reported having no seasonal accounts and one that the plan was not being applied to seasonal accounts.

Rural Reading, Billing, Collecting

Virtually all the companies having scattered rural territory have given consideration to having the meter reader bill and collect accounts.

Wisconsin Michigan Power Company adopted this program in one area temporarily, but discontinued the practice. Wisconsin Public Service Corporation is the only other that has adopted the reading, billing and collecting procedure and continued to follow it since the adoption of the quarterly reading plan.

Postcard Bills

Wisconsin Gas & Electric Company is using the postcard bill in one division and the Wisconsin Public Service Corporation is using it in areas where bills cannot be delivered.

While it wasn't covered in the survey, it was indicated that the Wisconsin Electric Power Company had adopted postcard billing throughout the entire territory.

Remainder of the companies reported giving "some study" to postcard bills.

AIR is LIFE to a miner...

but DEATH to unstable turbine oils!

IT'S the tiny bubbles of air in a hard-working turbine that cause oxidation. Ever present, they kill off an unstable oil in a hurry. But even the most adverse operating conditions make little difference to Shell Turbo Oil. Check the analyses at lower right . . . there's practically no difference in the characteristics of Shell Turbo Oil, even after 19,106 hours of wartime operation.

Here you have proof, under actual operating conditions, of the superior oxidation stability of Shell Turbo Oil.

Don't chance the possibility of oxidation or rust knocking out *your* turbines. Get the complete details on this and other outstanding performances of Shell Turbo Oil from the Shell man. Or, write Shell Oil Company, Inc., Dept. "D," 50 W. 50th St., New York, N. Y., or 100 Bush St., San Francisco, Cal.

SHELL TURBO OIL

Currently, the U. S. Navy has first call on Shell's entire production of marine turbine oil

SHELL

Certified Proof of the Superior OXIDATION STABILITY of Shell Turbo Oil

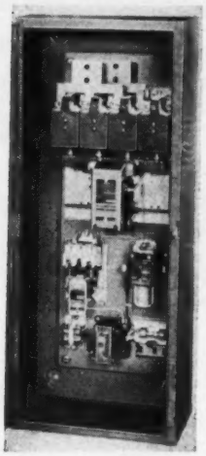
SHELL TURBO OIL WHEN NEW	CHARACTERISTICS	SHELL TURBO OIL AFTER 19,106 HRS. OPERATION
156	*Viscosity @ 100° F.*	160
Clear	*Appearance*	Clear
.05	*Neutralization No.*	.05
.1	*Saponification No.*	.1
90	*Steam Emulsion*	90

Performance record of Shell Turbo Oil in a unit of the OWENS-ILLINOIS GLASS COMPANY, Streator, Ill.

NEW EQUIPMENT

A. C. Welder Control

Class "8992" safety welder control panel. Industrial Controller Div., **Square D Co.**, Milwaukee, Wis.



Safety panel has been developed to eliminate the hazard created by high open circuit voltages on any make or model of transformer type a.c. arc welders. Welder transformer primary circuit is automatically disconnected after the arc is broken and is automatically reconnected the instant the operator touches the electrode to the work. Manufacturer claims no loss in operating speed or efficiency, saving in power, and improvement in power factor.

•

Fire Extinguisher

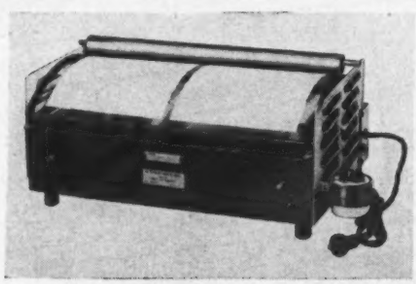
"C-D/FOG" fire extinguisher; sizes, 4 lb. and 15 lb. **The General Detroit Corp.**, 3200 East Jefferson Ave., Detroit, Mich.

An addition to the company's line is an extinguisher which discharges carbon dioxide from a horn and steel cylinder. It is claimed to be effective for classes B (flammable oils and liquids), and C (electrical) fires. Smaller size, manufacturer advises, carries an Underwriters' rating of B2-C2, and larger size a rating of B1-C1.

•

Printer

Blueprints or black-and-white prints can be made on a portable, table model printer which can be furnished with an automatic timer. Printing on a curved glass surface is said to give a perfect contact without the inconvenience of wrapping the prints around a cylinder. Prints can be made in approximately one-half minute and cost is claimed to be less than 1½ cents per square foot.

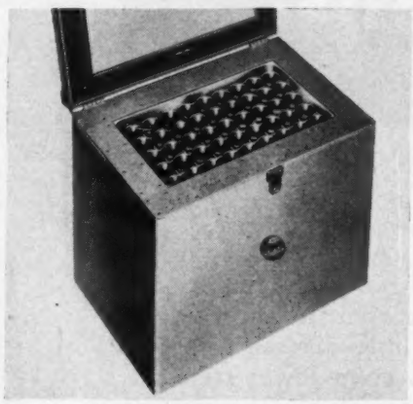


"Model 4353—Spee-Dee" printer; two sizes, for prints up to 12x18 in. and 18x24 in.; plugs into a 115-volt convenience outlet. **Peck & Harvey**, 4325 Addison St., Chicago, Ill.

•

Refrigerator

Low temperatures are provided by portable refrigerator for retarding the aging or hardening of heat-treated aluminum, such as rivets of 17 S-T or 24 S-T alloy. Rivets of 17 S-T alloy, ⅜- or ¼-in. size, may be stored for 30 days in the mechanical units with copper cups, it is claimed, after which time it is still possible to drive the rivets.



Portable refrigerator; standard temperature range, zero to —15 deg. F., also to —35 deg. F. with suitable control; can be operated from power outlet. **Jewett Refrigerator Co., Inc.**, 4 Letchworth St., Buffalo, N. Y.

•

Inspection Light

Design "No. 80093XA" inspection light; uses two 6-watt fluorescent lamps. **Curtis Lighting, Inc.**, 6135 W. 65th St., Chicago, Ill.

Essentially a magnifying lens with auxiliary lighting, new device is designed for use in ordnance plants where open-type units are not acceptable. Unit consists of steel housing 12⅝ in. in diameter and 2 in. deep with white "Fluracite" reflecting surface inside, magnifying lens of the double convex type, and shatterproof cover glass. Swivel base and movable arm are said to permit adjustment of the light over the inspection plane for correct focusing.

BUYING ELECTRICAL EQUIPMENT?—McGraw-Hill's *Electrical Buyers Reference* is a convenient place to look first for manufacturers' product data, names and addresses.

Fluorescent Starter

A glow-type lamp starter augments the company's line of fluorescent starters. Construction of this device is said to allow it

"Cat.FS, Glostat" fluorescent lamp starter; two sizes, one for use with 15- and 20-watt lamps, other for 30- and 40-watt lamps. **Sylvania Electric Products, Inc.**, Salem, Mass.

to take severe punishment from a failed lamp and, according to manufacturer's claims, it will show long life in service.

•

Control System

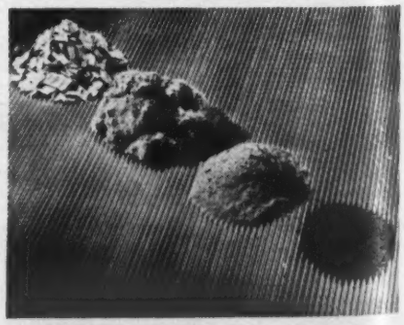
"Glo-Peg" lamp unit now available for incorporation in Uniturn System Operating Panelboards. **Braidwood Uniturn Systems**, Perth Amboy, N. J.

In addition to the manually turned multi-colored ball-unit indicators previously announced (ELECTRICAL WORLD, May 4, 1940) there are now offered "cold light" Glo-Peg indicators of plug-in type. Light sockets are mounted on the back-panel sections with intervening air spaces insulating the diagrammatic front-plate sections against heat. As the heat cannot store up within the panelboard, the life of the miniature-lamp filament is lengthened, it is claimed. Pilot lights operate from supervisory-controlled switches. Alternate red and green lights (SPDT) are both in one target. On-off lights (SPST) are interchangeable for red, green or clear.

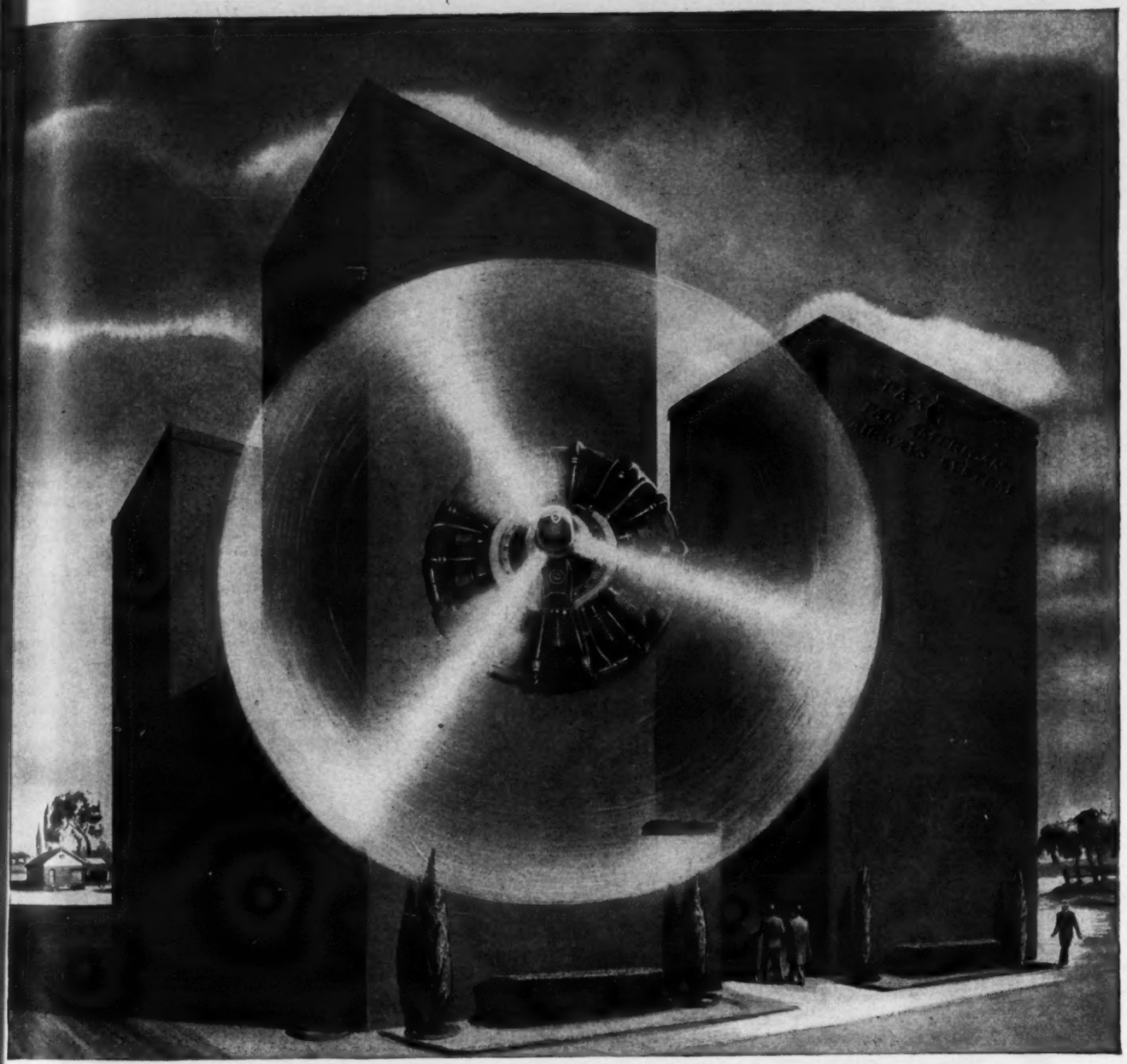
•

Plastic

A non-critical phenolic type thermoplastic is said to be chemically perfected from the phlobaphanic structures of the California redwoods and to embody in one composite form both resin and filler employed in the molding of products. It is claimed to be adaptable to compression molding and to produce finished products of excellent tensile strength.



"Shellerite" plastic. **Sheller Manufacturing Corp.**, Portland, Ind., also **Pacific Lumber Co.**, San Francisco, Calif.



Cave-of-the-Winds in Miami

Inside this unique building, the engines of Pan American Clippers are put through their paces. Propellers roar with the thunder of 4000 horsepower—creating super-hurricanes as air is pulled down one set of stacks and pushed out through the other set.

Outside, there's hardly a sound—for in each stack a honeycombed unit of cells soaks up the resonance, bit by bit, until it is finally dissipated.

Naturally, this completely windowless test house had to be air conditioned—to remove heat generated by the engines, to provide controlled testing temperatures, to make working conditions bearable for the engineers. As in so many other exacting applications of air conditioning and industrial refrigeration, the equipment selected was General Electric.

Today, G-E air conditioning and refrigeration engineers are devoting all their talents to problems of war production and testing. They are learning much that will lead to better, more economical manufacturing methods—to healthier, happier living—when we return to the pursuits of peace.

Air Conditioning and Commercial Refrigeration Department, Division 437, General Electric Company, Bloomfield, New Jersey.

Air Conditioning by

GENERAL ELECTRIC

"GLAD THE ENGINEERS ARE SPECIFYING HARPER BOLTS

"Harper Bolts don't rust. They're tough and they'll make this pump last a lot longer."

Yes . . . the non-ferrous and stainless fastenings made by Harper are adding extra toughness and extra service-life to vital parts of ships, tanks, jeeps, planes and other war equipment. Also in hundreds of war production jobs they are preventing failures of vital equipment and keeping production rolling. They have high tensile strength; they resist rust, corrosion, many acids and alkalies and other tough conditions.

4320 STOCK ITEMS . . . of bolts, nuts, screws, washers, rivets and accessories in the non-ferrous and stainless alloys.

WRITE FOR CATALOG . . . and reference book—80 pages—4 colors—193 illustrations—numerous tables and other data. Free when requested on a company letterhead.

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ARMY E NAVY

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EVERLASTING FASTENINGS

BRASS • BRONZE • COPPER • EVERDUR
MONEL • STAINLESS

TECHNICAL LITERATURE

MEASUREMENT OF TEST VOLTAGE IN DIELECTRIC TESTS—Approved by A.S.A. November 7, 1942, this standard C68.1-1942 supersedes the A.I.E.E. Standard No. 4, originally adopted May 18, 1928. Prescriptions are given for sphere gap settings and corrections, wave and crest measurements, direct voltage and surge-voltage tests. 23 pages. Published by American Institute of Electrical Engineers, 29 West 39th St., New York; price 40 cents each.

A.S.T.M. STANDARDS ON PLASTICS—Contains 71 specifications, methods of tests and definitions. Thirty standards have been developed by Committee D-20 on Plastics. Over 20 have been developed as a result of work of Committee D-9 in the field of electrical insulating materials. Standard test procedures cover arc resistance, resistance to chemical reagents, color fastness, compressive strength, relative humidity, deformation, distortion, dielectric constant, diffusion of light, flammability, flexural strength, flow temperatures, haze, impact resistance, mar resistance, punching quality, refractive index, surface irregularities, shrinkage, softening point, tensile properties, tear resistance, thermal conductivities, water absorption, etc. 384 pages, illustrated. Published by American Society for Testing Materials, 260 S. Broad Street, Philadelphia, Pa. Price $2.

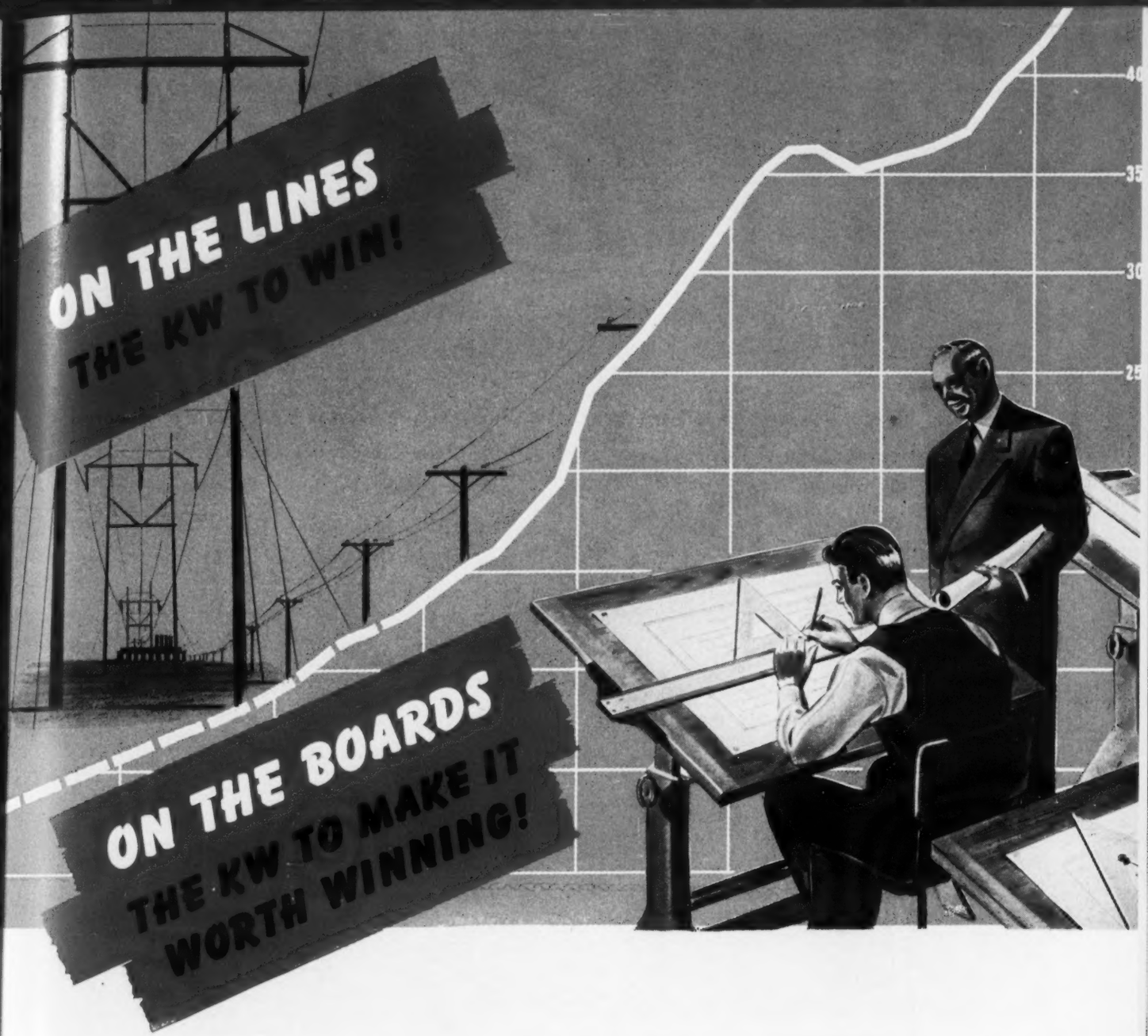
SAFETY EQUIPMENT—Covering personal protective equipment, from protective hats, gas masks, respirators and gas instruments, through the list of safety clothing, a well-illustrated handbook details the practical "do's and don'ts" of safety equipment care for key personnel, in a form readily adaptable for instruction of equipment users. Copy of the publication may be obtained from Mine Safety Appliance Co., Braddock, Thomas and Meade Sts., Pittsburgh, Pa.

POWER TUBES—Technical data on air- and water-cooled tubes, cathode-ray tubes, special purpose tubes, and phototubes, also circuit diagrams, filter design curves, transmitting circuit facts are contained in the war edition of "RCA Guide for Transmitting Tubes." The guide may be obtained from the Commercial Engineering Section, Radio Corporation of America, Harrison, N. J.; price 35 cents.

RAILWAY MACHINERY—"Rotating Electrical Machinery on Railway Locomotives and Rail Cars, and Trolley, Gasoline-Electric and Oil-Electric Coaches" is the title of a new American Standards covering railway and auxiliary motors, generators, auxiliary generators, dynamotors, and phase converters. Copy of publication A.I.E.E. No. 11 or A.S.A. No. C35.1-1943 may be obtained from American Institute of Electrical Engineers, 33 West 39th St., New York, N. Y.; price 50 cents.

BLOW TORCH—Instructions for operating and maintenance are given in action pictures shown on three small charts: (1) "How to Light Your Blow Torch," (2) "How to Clean Your Blow Torch," and (3) "How to Solder," issued by the Turner Brass Works, Sycamore, Ill.

METAL CONTACTS—Technical characteristics, design and application of electrical contacts of silver, platinum, tungsten, molybdenum and a variety of other metals and alloys are given in Cat. 152, "Electrical Contacts," issued by Callite Tungsten Corp., 544-39th St., Union City, N. J.



America is fighting an electrical war. It is being won only because our great systems of power generation and distribution has proved equal to a stupendous task. A capacity close to 50,000,000 kw—*four times that of World War I*—has been rallied to the cause.

Only because of foresight of our electric service companies was the challenge met. At the end of 1940, for each 1000 kw of peak load in the national total, 218 kw was standing by. This was the precious margin that prevented a power famine, and permitted large amounts of steel and construction materials to go to arms and ships and industrial machinery.

We dare not "blackout" this kind of foresight even as we fight. After winning an electrical war, we will face an equally challenging *electrical future*. And the widening use we then make of electric power, both in industry and the home, will help prove that the war was worth winning!

That's why there's a task "on the boards" as well as "on the lines" for power and light company engineers, just as there is for builders of tomorrow's electric and electronic appliances, and for suppliers who will be furnishing new and better products to the electric service industry . . . furnishing them "via GRAYBAR."

Executive Offices.
GRAYBAR BUILDING
New York, N. Y.

GraybaR

IN OVER 80 PRINCIPAL CITIES

GraybaR QUALITY SINCE 1869 *REG U.S. PAT. OFF.
Everything Electrical . . . . THAT IT TAKES TO WIN!

hot and bothered?

Here is inexpensive war-time insurance to forestall big and little shutdowns caused by wire trouble.

Keep on hand this T & B emergency assortment of Maintenance and Repair Pressure (solderless) Fittings.

A mere handful—32—will lug, connect, tee and parallel tap all your wire sizes up to 500 MCM. A screw driver or key wrench does the trick.

These T & B fittings have been engineered to replace literally hundreds of various and sundry styles and sizes. Being mechanical, they install fast. Being T & B quality, they stay fast. Approved by Underwriters Laboratories.

Order this emergency material from our stocking T & B Distributors (our sole channel of distribution) and use your factory's Priority Rating—thus helping to keep your War Production schedules clicking on time.

HERE ARE THE BASIC 32

LOCKTITE LUG

7 take ALL

cable sizes #4 to 1,000,000 CM.

HINJON JUNIOR

12 tap ALL

mains #8 to 1,000,000 CM to all branches #14 to #1. Solid or stranded.

LOCKTITE TAP

6 tap ALL

mains 1/0 to 500,000 CM to all branches #2 to 500,000 CM.

LOCKTITE 2-WAY

7 make ALL

splices #4 to 1,000,000 CM.

Our Distributors stand ready to make up special assortments for your special needs.

Write us for folder, "Quick Help" on your Maintenance and Repair Jobs.

THE THOMAS & BETTS CO.

INCORPORATED

MANUFACTURERS OF ELECTRICAL FITTINGS SINCE 1899

ELIZABETH, NEW JERSEY

In Canada: Thomas & Betts Ltd. Montreal

. . . FOR TODAY'S ESSENTIALS

WINNING THE "War of Nerves"

ORANGEBURG STANDARD

Orangeburg *Standard*, encased in concrete, is the most economical construction where duct-banks of four or more ducts are involved. For nearly half a century, this conduit has been serving industrial plants, utilities, railroads and municipalities, protecting cables underground with this type of construction.

ORANGEBURG NOCRETE

Orangeburg Nocrete is most economical as it can be installed underground without concrete encasement. Its characteristics of mechanical strength combined with exceptional deflection make it ideal for services where ground stresses and settlement are encountered.

● *Every* American war plant is a *"bundle of nerves"*—a complex network of cables and wires. These "nerve centers" supply the plant with light and power, as well as the *vital juice* for its fire, telephone, signal and other forms of internal and external communication.

Today—as never before—the safest place for cable and wire is *underground*—in Orangeburg Conduits.

Orangeburg Fibre Conduit is helping war plants the country over to win the "war of nerves". A *non-critical* material itself, available immediately without priority, it affords complete protection to cable which *is "critical."*

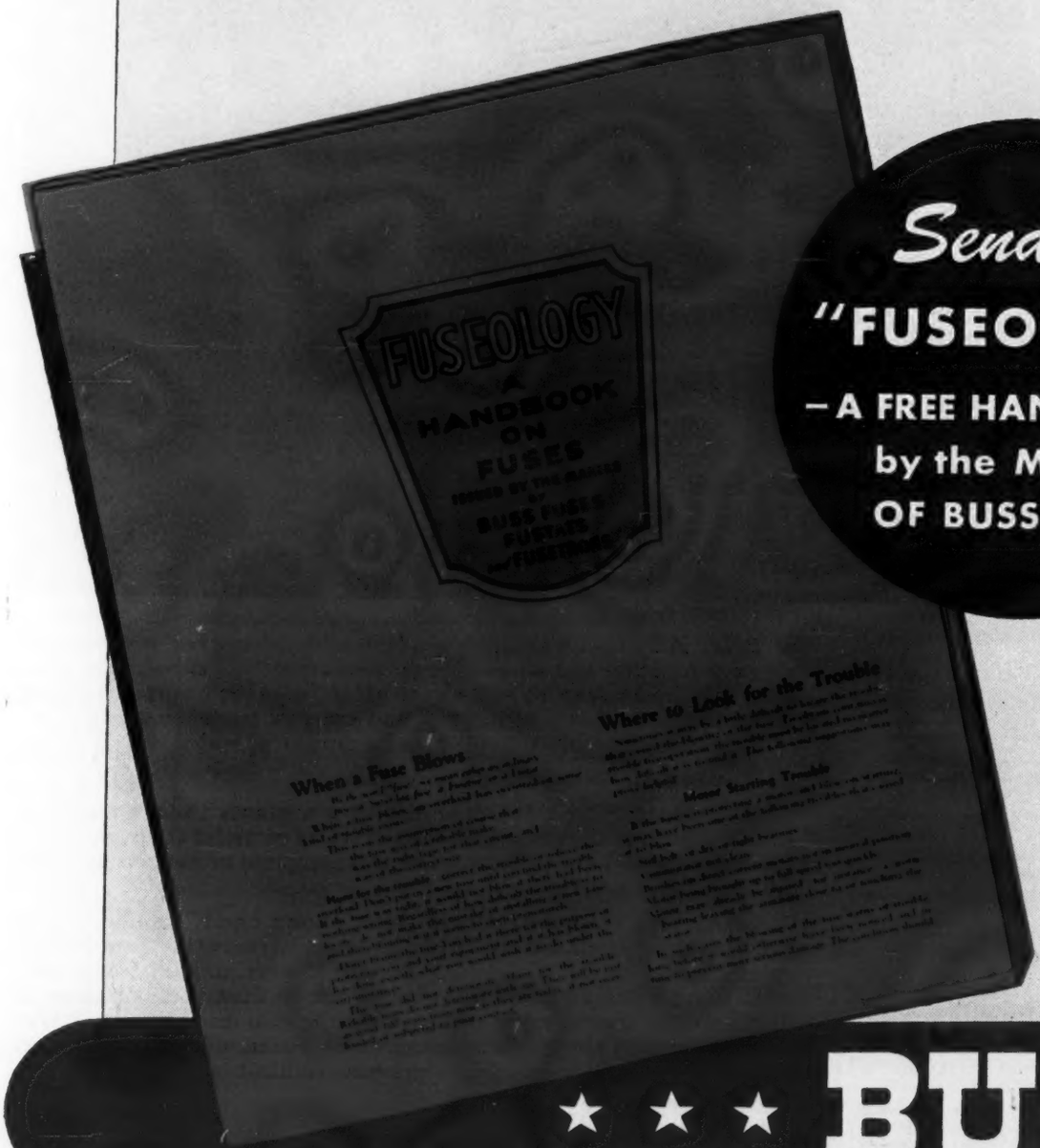
Orangeburg's tapered sleeve joint allows rapid installation and provides tight joints with perfect alignment of raceways. Low friction co-efficient of ducts allows long cable pull even around bends with minimum tension on cable. Interior surface of duct does not score or damage cable sheath when pulling, and the coal tar pitch and fibre surface protects sheath from corrosion at points of contact. Impermeability of conduit and joints prevents infiltration of corrosive elements at all points on the line.

ORANGEBURG CONDUITS

Made at Orangeburg, N. Y. by The Fibre Conduit Co., 292 Madison Ave., N. Y. C.

FOR TOMORROW'S BETTERMENTS

To help maintenance men get more service from fuses—



Send for
"FUSEOLOGY"
—A FREE HANDBOOK by the MAKERS OF BUSS FUSES

★ ★ ★ **BUSS**

GraybaR
Since 1869
*REG U.S. PAT. OFF.
Everything Electrical
• • • • THAT IT TAKES TO WIN!

. . . FOR TODAY'S ESSENTIALS

WITH this helpful guide and handbook, even a new man can learn easily and quickly to service fuses properly.

Written in clear, simple style and well illustrated, it is a "training manual" for practical men.

It's *usable*, for it contains the very information that every maintenance man should have at his finger tips—

- ✓ What to do when fuses blow
- ✓ Where to look for trouble that caused fuses to blow
- ✓ What to do after you have found the trouble
- ✓ How to select the right type fuses for various circuits
- ✓ How to determine proper size fuse or fusetron to use for different applications
- ✓ How to save material and cut costs on motor installations
- ✓ And many other helpful suggestions that will help anyone reduce lost time by reducing shut-downs due to improper fusing.

Why not get this complete handbook free?

BUSSMANN MFG. CO.
Division of McGraw Electric Company
University at Jefferson, St. Louis, Mo.

BUSS Super-Lag Fuses
BUSS Fusetrons
BUSS One-Time Fuses

BUSS FUSTATS

BUSS Plug Fusetrons
BUSS Plug Fuses

Send the Coupon NOW!

FUSES

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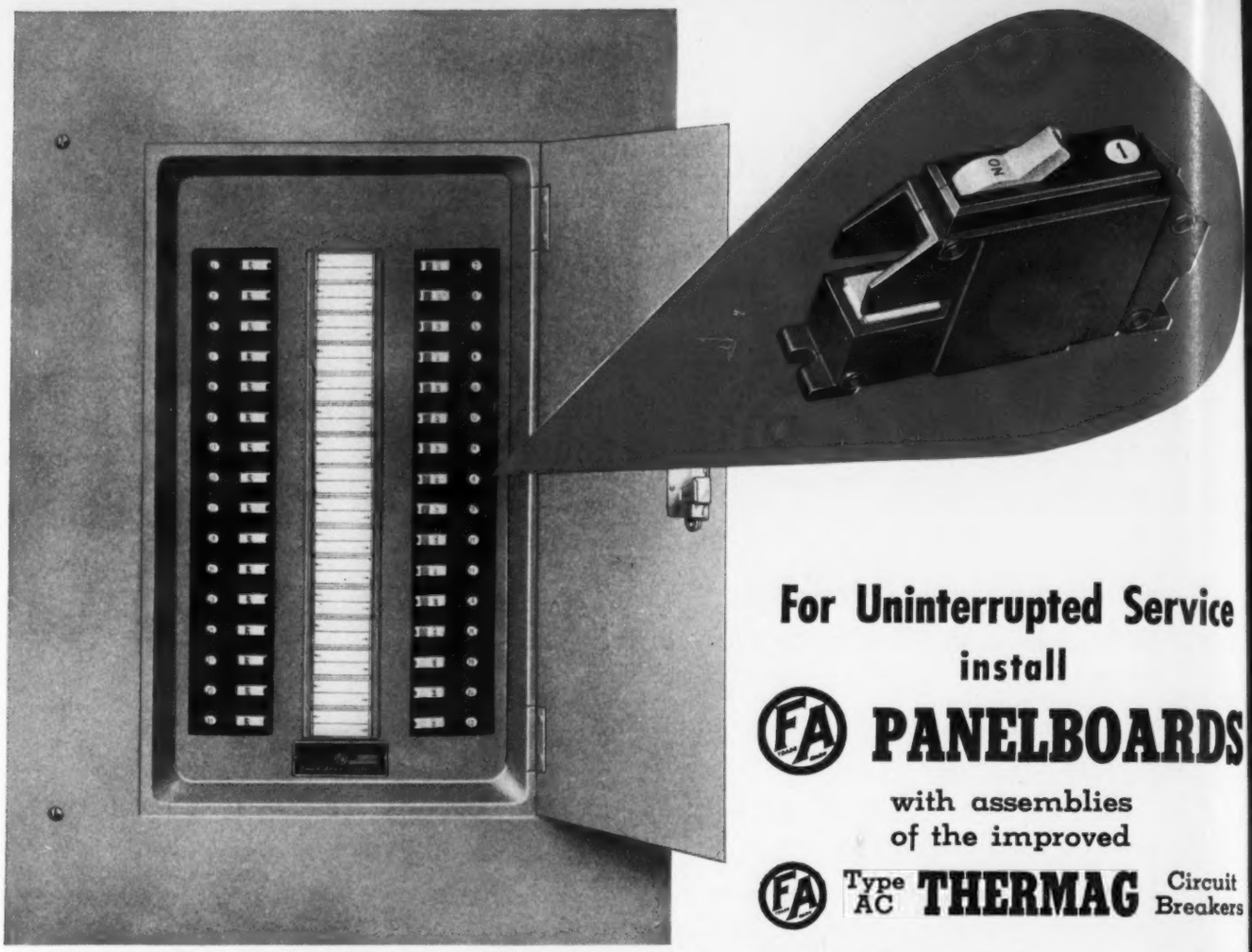
FOR TOMORROW'S BETTERMENTS

GraybaR Everything Electrical GraybaR ELECTRIC COMPANY



For Uninterrupted Service install

FA PANELBOARDS

with assemblies of the improved

FA Type AC **THERMAG** Circuit Breakers

The Safety Panelboard above is Catalog No. FA NAC1B32-3L20. It contains 32 FA Type AC Thermag Circuit Breakers, and 200 ampere 3 wire main connection. An enlarged view of the individual Circuit Breaker is shown at the right.

They not only provide full protection against short circuits and dangerous overloads, *but prevent unnecessary interruptions in service* due to momentary or slight overloads.

The combination of the time-tried THERmal trip with the new MAGnetic trip, in the individual circuit breakers, assures this double protection. On harmless, momentary overload the time lag characteristics of the thermal element prevent interruption of service, but trip on sustained, harmful overload. On short circuit, the magnetic element causes *faster* tripping.

When tripped, the handle of the single pole breaker automatically returns to the OFF position, thus indicating the circuit affected. On the double pole breaker, a red signal button is protruded from the face of the breaker on which the trouble has occurred.

Write for BULLETIN 69

Especially prepared for the use of Architects, Engineers and Contractors, it contains a mine of useable information on panelboards and cabinets. It is a real aid in planning and engineering electric distribution installations for light, heat and power. Write for your copy . . . Frank Adam Electric Co., St. Louis, Mo.

FA PANELBOARDS—THERMAG EQUIPPED

are made in Standard Type, Narrow Column Type, and Dust-tight Type construction. They are available with from 4 to 42 circuits, for either flush or surface mounting . . . Capacities: 50 amperes or less, 120 volts AC, single or double pole, individual trip . . . Approved by Underwriters' Laboratories, Inc.

Installation and connection are facilitated by new and improved FA Pressure Connectors. Ample knockouts are provided in the steel boxes. Fronts are bonderited, to prevent rusting, and finished in pearl gray lacquer.

EST. 1891 — THE SIGN OF A BETTER JOB

Frank Adam

ELECTRICAL PRODUCTS
for War Industry

FRANK ADAM ELECTRIC CO.
ST. LOUIS, MO. U.S.A.

GraybaR — Since 1869 — Everything Electrical . . . . THAT IT TAKES TO WIN!

. . . FOR TODAY'S ESSENTIALS

AMERICAN MANUFACTURING COMPANY

NOBLE and WEST STS., BROOKLYN, N. Y.

ROPE TWINE PACKING OAKUM

WESTERN FACTORY:

ST. LOUIS CORDAGE MILLS

ST. LOUIS, MISSOURI

SALES OFFICES: Baltimore, Boston, Chicago, Houston, New Orleans, Philadelphia

BUY WAR BONDS

FOR TOMORROW'S BETTERMENTS

TOUGH!

Glass insulators made by Armstrong Cork Company perform satisfactorily in torrid heat and subzero cold

UNIVERSAL DISTRIBUTION TYPE

You can use this universal-type insulator as a side-groove, a top-groove, or as a double-groove insulator—the double groove being adaptable for breaking a series street-lighting circuit at a lamp cut-in. This interchangeability enables you to reduce inventory by replacing three conventional-type insulators with one universal type.

The top groove and upper side groove of the No. 512U accommodate conductors up to the diameter of 4/0 tree wire. The lower side groove takes conductors up to the equivalent size of No. 4 tree wire.

The uniform, crystal-clear glass of Armstrong's "Whitall Tatum" Insulators is free of flaws. Pin cavities are accurately gaged to insure proper pin fit. These qualities, plus test-proved resistance to thermal shock, assure you these insulators will withstand all weather conditions.

Armstrong's No. 512U meets all the requirements and tests listed in the booklet on specifications for lime-glass insulators. (See box at left.) For complete information, samples, and prices of all Armstrong's Glass Insulators, telephone or write to your local Graybar representative.

NOW Specifications for Low- and Medium-Voltage Pin-Type Lime-Glass Insulators

For the first time, industry-wide standards have been set for lime-glass insulators. They have been published as specifications in booklet form. These specifications were prepared by the Joint Edison Electric Institute and Glass Manufacturers Committee, and approved by the Transmission and Distribution Committee of the Institute.

There is a limited supply of these specifications available for distribution to users of insulators. For your free copy, write to Armstrong Cork Company, Industrial Division, 295 Fifth Ave., N. Y. C.

ARMSTRONG'S "WHITALL TATUM" GLASS INSULATORS

GraybaR Since 1869 *REG. U.S. PAT. OFF. Everything Electrical .... THAT IT TAKES TO WIN!

. . . FOR TODAY'S ESSENTIALS

How the Right Kind ot Lighting Helps Improve Production

Laboratory Findings: ①

LIGHT ACTS AS MAGNIFIER

Ability to see small details increases as illumination is increased. Light is a magnifier of small detail. (page 14)

ELIMINATION OF GLARE

When a glare source was located within 5 degrees of the line of vision, 84% of the light on the test object was wasted due to the presence of the glare source. (page 15)

FASTER SEEING

It takes time to see. Tests show that as illumination is increased from 1 to 100 footcandles, speed of seeing is practically doubled. (page 16)

GREATER EASE OF SEEING

Better illumination aids the individual in performing visual tasks. In one series of comprehensive tests, those with better eyes were aided 14% by better lighting while those with most deficient eyes were aided 22%. (page 17)

Industry Experience: ①

IMPROVED ACCURACY OF WORKMANSHIP

A manufacturer of *heavy aircraft parts* reports inspection more efficient and production increased when lighting was improved (to 40-50 footcandles). Tool marks were easily seen and file marks revealed under the new lighting. (Case No. 79)

LESS SPOILAGE

A roller bearing manufacturer states that since lighting was improved (level raised from 15 to 45 footcandles), grinder operators spot improper grinder performance more quickly and can correct this before the work is spoiled. (Case No. 8)

INCREASED PRODUCTION

A valve manufacturer finds his men can read verniers more quickly with better lighting. Resultant over-all increase in production was 25%. (Case No. 30)

LESS FATIGUE

A manufacturer of intricate aluminum castings reports that his workers were less tired at the end of the day with new lighting (35 to over 60 footcandles), with higher values at final inspection benches. (Case No. 20)

① *Data Source: "Value of Good Lighting in War Production," a report issued by the Illuminating Engineering Society.*

Helping War Plant Personnel to IMPROVE PRODUCTION is an Important Part of YOUR WAR TASK

Securing the improved production and all the other benefits of good lighting depends upon your making certain that the right kind of lighting is being provided for every operation in your plant.

What is the "Right Kind of Lighting"?

The basis of all good lighting is enough light—25 to 50 foot candles or more—depending upon the seeing task performed by your employees. In addition, such lighting must be properly directed and diffused as well as uniformly distributed over the working area.

However, most of the benefits from such good lighting are lost unless provisions are made to reduce direct and reflected glare to the minimum by the use of properly designed and installed lighting equipment.

Such lighting equipment also must be designed to provide maximum assurance against lighting failure, provide maximum light output consistent with proper shielding and operate at a minimum of maintenance trouble and expense. ②

Free Lighting Guide

In the Benjamin booklet: "Specifications for Productive Lighting in War Plants," is contained complete, concise information on how to obtain the right kind of lighting in your plant. Also data relative to the importance of reflector design and rigid Benjamin standards for mechanical strength which Benjamin, through 40 years of experience, has found to be essential for industrial lighting. A copy of this guide will be sent to you without cost or obligation. Simply write the Product Information Department K, Benjamin Electric Mfg. Co., Des Plaines, Illinois.

② *See Benjamin booklet: "Benjamin Specifications for Productive Lighting in War Plants". Also American Recommended Practice of Industrial Lighting" approved by the American Standards Association.*

BENJAMIN
TRADE MARK

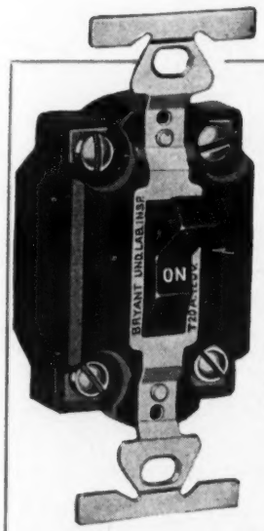
Lighting Equipment

FOR TOMORROW'S BETTERMENTS

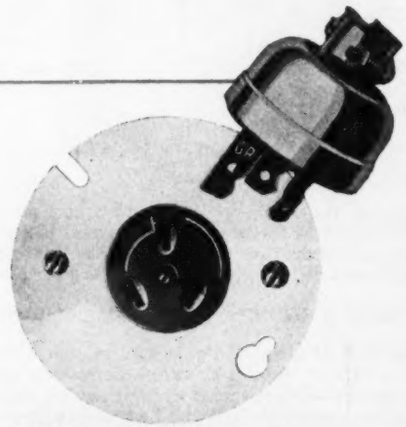
GraybaR Quality Since 1869 Reg. U.S. Pat. Off.
Everything Electrical
GraybaR Electric Company

Bryant heavy duty wiring devices

Bryant industrial devices have that extra ruggedness to stand up under war time production conditions. Bryant switches, sockets, outlets, fluorescent starters and devices can all be depended upon to do their job on the production front.



SHALLOW 20-AMPERE FLUSH SWITCH NO. 5862 is made to withstand the continuous use required in industrial service today. The mechanism is enclosed in rugged bakelite. The handle is made of a special unbreakable plastic. New type mechanism insures trouble-free service. U.L. "T" rated. Conforms to Federal Specifications.



20-AMPERE 3-WIRE OUTLET NO. 9324 AND NO. 9322 PLUG for grounding and for providing electrical service to industrial equipment. Long grounding prong on PLUG assures safe grounding. Extra heavy double-sided contacts insure positive register.

NO-BLINK STARTER FS4-NA provides perfect starts and also stops blinking immediately when the lamp becomes deactivated. When a worn out lamp is replaced, the starter functions at once—automatically.

SOLD THROUGH ELECTRICAL WHOLESALERS

THE BRYANT ELECTRIC COMPANY

BRIDGEPORT, CONNECTICUT

BRYANT
SUPERIOR WIRING DEVICES

Graybar
Everything Electrical
. . . . THAT IT TAKES TO WIN!
. . . FOR TODAY'S ESSENTIALS

One of these anchors will meet your specific needs

Today's pole line construction calls for speed without waste. You can conserve time and materials by making anchor selections from this complete line of anchors that meet all requirements.

NEVER CREEP ANCHORS—the only anchors that pull 100% against solid, undisturbed earth. Proven by time tests to retain holding power better than any other type of anchor. Never Creep Anchors are installed in three quick simple operations—bore the hole, drive the rod, hang on the plate. The anchor consists of only two pieces—rod and plate, and is recommended for installations in average soil where anchor and plate can be at or near right angles. Complete details on the sizes and holding power are in your Chance catalog.

CHANCE STEEL EXPANDING ANCHORS are the choice of many engineers and construction men for installations where expanding anchors can be used to advantage. Their all steel construction makes them practically unbreakable. They expand, on the average, to more than two and one-half times their size, giving extra area in solid earth. The nut retainer on the base plate prevents the anchor from riding up the rod and makes it possible to abandon the anchor and retrieve the rod or drive it down. Rigid connections and deep grooves prevent rocks or roots from deflecting blades during expansion. (See sketch) Blades expand in opposite directions, equalizing strain and eliminating side twists.

CHANCE SCREW ANCHORS—the no wrench type (in circle) can be installed without using a wrench. The large tripleye on the rod admits a bar for use in screwing the anchor into the ground. This no wrench anchor has a high carbon, forged steel rod and a malleable helix fastened securely to it. They can not slip in apart or turn separately. The large eye, thin, sharp blade, and square hub all help to speed up installations of this light weight screw anchor.

THE SWAMP SCREW ANCHOR—at extreme right is so constructed that when the pipe is screwed into the hub, it wedges in tight and will not screw out. The anchor has a large tripleye nut for one, two, or three guys. A short flanged cutting edge cuts quickly and easily through roots, etc.

CHANCE ROCK AND CONE ANCHORS—Where solid rock is encountered, the Chance Expanding Rock Anchor does the job without the aid of lead or concrete. Installation steps are simple. Drill a hole, drop anchor in, turn rod with bar to expand and the job is done. The wedge tightens as the pull increases.

For rocky or sandy soil and some hardpan, the Chance Pyramid Cone Anchor is recommended and widely used. The flat faces and flaring base provide a good wedging surface for rocks. A nut retainer aids installation.

All of the anchors shown here are made in a wide variety of sizes and each type is designed to give best results under specific soil and guying conditions. One of these will meet your specific needs for a specific job. For a variety of conditions you can select from this group the anchors which will do the jobs best. Your Chance catalog of pole line equipment will give you the complete details.

Specify CHANCE anchors for line security

Ask the Graybar man or consult your Chance Catalog

FOR TOMORROW'S BETTERMENTS

GraybaR Everything Electrical GraybaR ELECTRIC COMPANY

HOT ARCS STOPPED COLD!

Streamlined, push ty
front-operated rocker h
dle *inside* cabinet lines

BullDog's Vacu-Break Safety Switch with "Clampmatic" Contacts provides the faster, tighter closing—and quicker, smoother opening—needed for safest, most dependable operation at lowest maintenance cost.

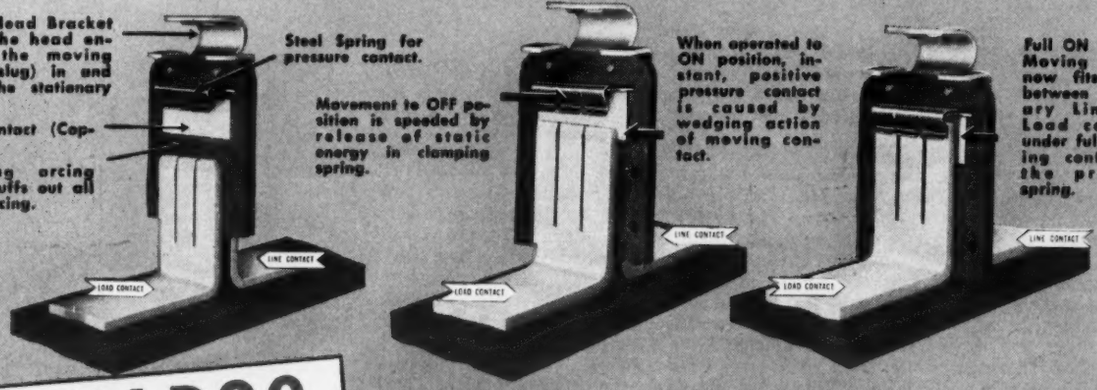
ON "Clampmatic" switch contacts exert a wedging action when engaged with the beveled ends of the stationary contact prongs. This wedging action puts great pressure on the movable slug, for positive pressure contact in ON position.

OFF When the handle is pushed to OFF position, the static energy stored in clamp spring helps make an easier, smoother separation of contacts. This quick-break operation in the close-fitting arc chamber creates a MAGNETIC BLOWOUT effect which quickly dissipates arcing.

BULLDOG *Vacu-Break* SAFETY SWITCH

with "Clampmatic" Contacts and front-operated Rocker Handle.

In these illustrations the formed bakelite covers (arcing chambers) have been removed from switch head to show action.


Switch Head Bracket pushes the head enclosing the moving contact (slug) in and out of the stationary contacts.
Moving Contact (Copper Slug).
Tight-fitting arcing chamber snuffs out all incipient arcing.
Steel Spring for pressure contact.
Movement to OFF position is speeded by release of static energy in clamping spring.
When operated to ON position, instant, positive pressure contact is caused by wedging action of moving contact.
Full ON position. Moving contact now fits tightly between stationary Line and Load contacts under full clamping contact by the pressure spring.
LINE CONTACT
LOAD CONTACT

BULLDOG
ELECTRIC PRODUCTS CO.
Detroit, Michigan
BullDog Electric Products of Canada, Ltd., Toronto, Ontario
Field Engineering Offices in All Principal Cities

MANUFACTURERS OF Vacu-Break Safety Switches, SafToFuse Panelboards, Circuit Master Breakers, Switchboards, Bus Duct Systems—FOR LIGHT AND POWER.

You SAVE it...when you SPEND it...on WAR BONDS

GraybaR Since 1869 *Everything Electrical* . . . . THAT IT TAKES TO WIN!

. . . FOR TODAY'S ESSENTIALS

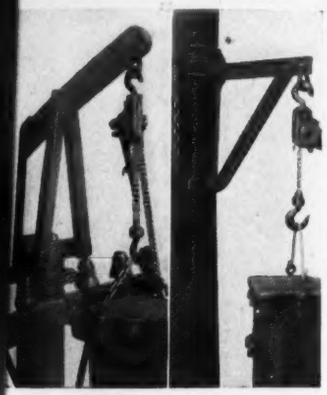
MAINTENANCE *with* COFFING UTILITY TOOLS

The Safety-Pull is the original ratchet lever hoist with the unusual safety feature of dual ratchet and pawl assembly with handle always under control. Compact, low cost, lightweight, strong. New models are easily converted to different capacities by means of a snap hook. Tested at 100% over rated capacity. ¾- to 15-ton—weighs 14 to 150 lbs.

More than 86% of all the utility companies in the United States are using Coffing tools. For the lifting or pulling problems in the inevitable jobs that face your maintenance and construction departments every day the Coffing Utility Maintenance tools can be the most useful tools on the truck.

TEMPORARY CROSS ARMS

Coffing Temporary Cross Arms are built to stand hard usage. They weigh much less than a standard cross arm, and no line truck should be without at least one set. They will pay for themselves many times a year through emergency and general use.



MODEL WT **MODEL ST**

POLE TOP GINS

MODEL WT—The main body and legs of this gin are made of seasoned hickory, bolted to sturdy malleable iron clamp that cannot be pulled off top of pole. Weighs only 28 pounds and is so constructed that it is a non-conductor of electricity. All models have been tested to more than 3,000 pounds without any signs of yielding.

MODEL ST—This gin is designed to clamp on side of pole and in many cases is more desirable than the pole top gin. Made of malleable iron and steel and weighs only 28 pounds.

TEMPORARY GUY CLAMP

Coffing Guy Clamps are built on the vise principle, with vise screw enclosed in a steel magazine. They have a very powerful grip, are easy to handle. An automatic grip placed on one end permits necking as close to the pole as desired without slipping. Weight 3½ lbs.

FLAG and FLAG HOLDER

The Coffing Flag Holder is designed to fit all poles. Main body casting and locking handle are made of certified malleable iron. Strong coil spring between chain and main body assures tension on locking chain. The Coffing Flag is made of 6-ounce army duck.

COFFING LOAD BINDERS

For booming poles, logs, pipes, etc., the Coffing Load Binder is the safest and most powerful boomer on the market today. The Model A weighs only 11 lbs., and will boom a load of 4,000 lbs. The Model F boomer weighs 24 lbs., and will boom a load of 6,000 lbs.

CONSERVE AND PROTECT AGAINST ABUSE YOUR PRESENT MAINTENANCE AND CONSTRUCTION TOOLS. THEY ARE YOUR PRICELESS WEAPONS

WRITE TODAY FOR CATALOG GE 6

COFFING HOIST COMPANY

MANUFACTURERS OF:

Safety-Pull Ratchet Lever Hoists, Load Binders Temporary Guy Clamps, Pole Top Gins, Temporary Cross Arms, Power Pike Poles.

DANVILLE ILLINOIS

POWER PIKE POLE

This item is entirely new in the Coffing line of utility tools. It is built of two pieces of galvanized pipe which telescope. Power is obtained from a "Safety-Pull" Hoist, or a Coffing Load Binder. Used for straightening leaning poles, one man can do the work of 6 men.

Minimum height, 8'-2"; maximum, 11'-7". Weighs only 32 lbs.

FOR TOMORROW'S BETTERMENTS

GraybaR Everything Electrical GraybaR ELECTRIC COMPANY
SINCE 1869 QUALITY
REG. U.S. PAT. OFF.

EVERSTICK ANCHORS

FOR TOUGH ANCHORING JOBS!

War-time anchoring jobs bring Eversticks to the forefront. They provide tight, safe anchoring . . . always in excess of rated capacities. Easy and quick to install . . . made of finest grade malleable iron with superior rust-resistant qualities and exceptional toughness. Every Everstick is plainly marked for ease of handling and storing.

The nut housing feature of the Everstick prevents rod from slipping thru while installing and provides a solid substantial base for the expanding blades.

There's a complete line of Eversticks for all strain requirements. 15 sizes of 2-way—3-way—4-way types.

EVERSTICK ANCHOR COMPANY, Fairfield, Iowa

GraybaR
Everything Electrical
. . . . THAT IT TAKES TO WIN!
Since 1869
REG. U.S. PAT. OFF.

. . . FOR TODAY'S ESSENTIALS

DAY-LINE
NTINUOUS
2-40 Watt,
0 Watt, and
00 Watt Lamps

The DAY-LINE UNIT
For 2-40 Watt, 3-40 Watt, and 2-100 Watt Lamps

NEW WAR MODELS!

MEET W.P.B. STEEL LIMITATIONS

Reflectors of the War Model Day-Line are finished with long-life "Super-White" baked enamel that is strongly bonded to the reflector surface, is free from grain or bubbles, provides higher reflection values because it's satin smooth and easily cleaned.

Still retaining all the superior illumination qualities of previous Day-Line Industrial Fixtures—these new War Models are designed to save critical war materials. They furnish light for the production front and release materials for the battle front.

An outstanding feature of these new War Models is the *1-piece end stamping* which is welded to the "backbone" of the fixture. This insures unusually substantial construction . . . In assembling the units into continuous runs a high degree of rigidity is attained by employing a strap coupler which is securely bolted into position . . . Flexible surface or suspension mounting . . . Starters accessible without disturbing lamps . . . on-metallic reflectors are quickly removable for free access to wireways . . . Ballast maintained under top channel for cool operation . . . Get further details. Call your Day-Brite Engineering Representative.

DAY-BRITE LIGHTING, INCORPORATED
5494 BULWER AVE. • SAINT LOUIS, MISSOURI

DAY-BRITE LIGHTING INCORPORATED
Day Brite
LIGHTING FIXTURES
ST. LOUIS, MISSOURI, U.S.A.

THE SIGN OF QUALITY
LOOK FOR THE LABEL

Day Brite
LIGHTING FIXTURES

The COMPLETE LINE OF FLUORESCENT LIGHTING FIXTURES

FOR TOMORROW'S BETTERMENTS

GraybaR
Everything Electrical
GraybaR
ELECTRIC COMPANY

HERE IS WHAT YOU WAN TO KNOW ABOUT RELAYS

Write for your copy today!

The Struthers-Dunn Catalog has been prepared with a careful eye toward enabling you to select Relays and Timers intelligently from a line that covers just about every need—and then to use them to best possible advantage.

In addition to complete descriptions of standard Struthers-Dunn types, this Catalog contains a wealth of Relay engineering and application data which should prove both interesting and helpful. Behind this, our district engineers in the cities listed below stand ready to help in solving your Relay-Timer problems.

STRUTHERS-DUNN, Inc.

1321 ARCH STREET, PHILADELPHIA, PA.

DISTRICT ENGINEERING OFFICES: ATLANTA • BALTIMORE • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • HARTFORD
INDIANAPOLIS • LOS ANGELES • MINNEAPOLIS • MONTREAL • NEW YORK • PITTSBURGH • ST. LOUIS • SAN FRANCISCO • SEATTLE • SYRACUSE • TORONTO • WASHINGTON

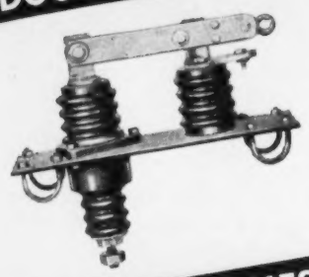
"Graybar" Since 1869 *REG. U.S. PAT. OFF.
Everything Electrical . . . . THAT IT TAKES TO WIN!
. . . FOR TODAY'S ESSENTIALS

THREE E — ELECTRICAL ENGINEERS EQUIPMENT CO. — MELROSE PARK, ILL. U.S.A. — THE MARK OF QUALITY

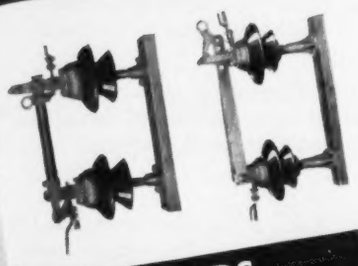
GraybaR — Everything Electrical — GraybaR ELECTRIC COMPANY — SINCE 1869

A Partnership FOR SERVICE IN WAR OR PEACE

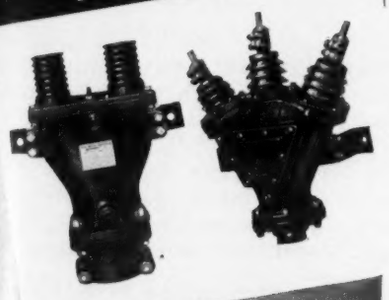
INDOOR SWITCHES



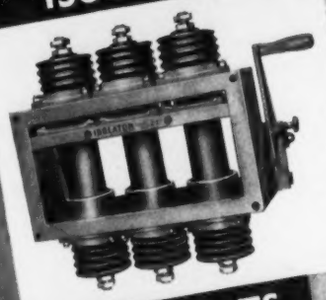
OUTDOOR SWITCHES



POTHEADS



ISOLATORS



BUS SUPPORTS

• For more than a quarter of a century Graybar and "THREE E" have cooperated to better serve the electrical industry. Now, with our Country engaged in the most devastating war of all time, this association continues to efficiently produce and distribute "THREE E" equipment to Army Camps, Air Bases, Navy Yards, Defense Plants, Utilities, and to many other activities connected with the war effort.

When Victory finally comes to the Allied Cause, Our Country at peace will find Graybar and "THREE E" carrying on—Graybar as usual prepared through its widespread and well organized service facilities, and "THREE E" ready with the most modern high voltage switches and protective equipment of strong, precision construction for low cost, flexible installations.

•

More than 30 years of specialization in designing and building correct substations and high quality equipment are your assurance of receiving modern, efficient equipment with resultant long, economical, trouble-free service.

OTHER Three E PRODUCTS

- Fuse Mountings
- Fused Disconnects
- Clamp Insulator Supports
- Air Break Switches
- Structural Fittings
- Power Connectors

ELECTRICAL ENGINEERS EQUIPMENT CO.

MELROSE PARK, ILLINOIS

FOR TOMORROW'S BETTERMENTS

GraybaR — Everything Electrical — GraybaR ELECTRIC COMPANY — SINCE 1869

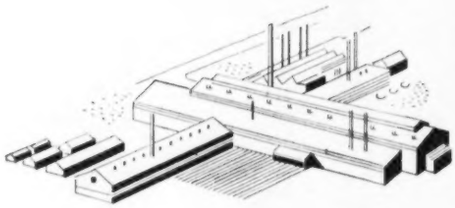
DELTABESTON

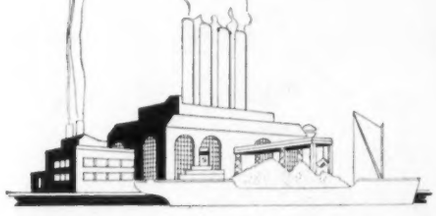
for Wartime Wiring

Today, the wartime might of our factories, steel mills, mines and shipyards depends more than ever on the Nation's electrical power. Control and distribution of this power to produce an endless chain of tanks, ships, planes and numerous other weapons of war require rugged and dependable cable.

Deltabeston Asbestos-insulated Wires and Cables are performing with the utmost dependability on vital war jobs all over the land. They last and do the job well . . . where excessive heat causes frequent replacements of other cables.

For forty years the Graybar Electric Company has been distributing Deltabeston Asbestos-insulated Wires and Cables to the electrical industry. Today, as in World War I, Graybar and General Electric are working around the clock supplying:





Deltabeston Power Cable Types AVA or AVL for general wiring in power plants, steel mills, boiler rooms and in other torrid zones where constant high temperatures prevail. Insulated with felted asbestos, varnished cambric insert and asbestos braid or lead sheath.

Deltabeston Switchboard and Hinge Cable Types AVB or SNA for wiring swinging panel connections, general switchboard and all other types of control apparatus. Insulated with varnished cambric or extruded synthetic, felted asbestos, flameproof braid finish.

Deltabeston Boiler Room Wire Type AVA for wiring in central stations, steel mills, boiler rooms and other installations where resistance to high ambient temperatures is required. Insulated with felted asbestos, varnished cambric insert and asbestos braid.

And numerous other types of wires and cables to bring victory sooner.

HERE'S THE ANSWER TO YOUR WIRING PROBLEMS WHERE HEAT ENDANGERS.

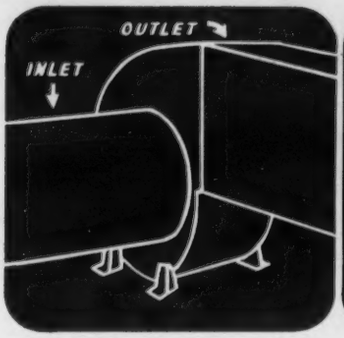
It's yours for the asking. See your Graybar Distributor or write to Section Y632-9. Appliance and Merchandise Dept., General Electric Co., Bridgeport, Conn. Deltabeston Wires and Cables are distributed nationally by Graybar Electric Co.

GENERAL ELECTRIC

. . . FOR TODAY'S ESSENTIALS

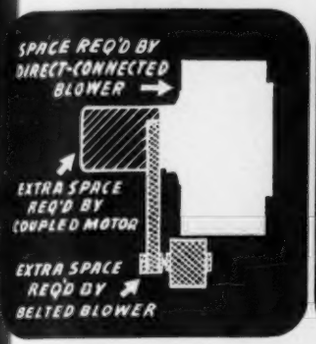
Facts

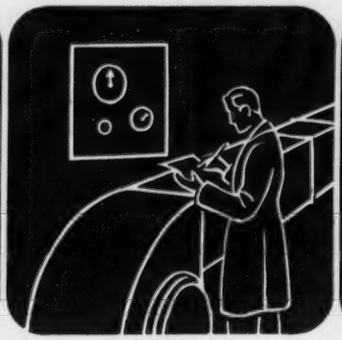
YOU SHOULD KNOW ABOUT UNIVERSAL BLOWERS

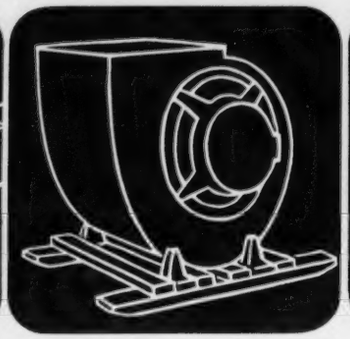


1 A blower draws in air from one system of ducts and forces it through another system . . . brings in outside air, exhausts "used" or impure air . . . also used for circulating either warmed or cooled air.

2 Although Ilg makes *both* belted and direct-connected blowers, direct-connected type is usually recommended to save money-wasting friction from reduction of high speed motors through belts, pulleys.







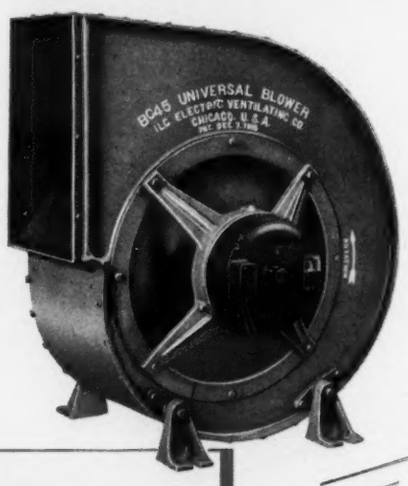
3 Direct-connection of motor and wheel permits recession of motor in blower housing . . . compact . . . requires minimum floor space. Note *extra* space required by belted blower or blower driven by coupled motor.

4 Each Ilg Direct-Connected Blower is engineered and manufactured as a balanced, integral unit . . . self-contained . . . tested under load conditions . . . shipped completely assembled . . . "factory-set" alignment.

5 Ilg Blower arrives on skids . . . rolled or suspended into position . . . bolted down, ready to operate. No belts, pulleys or guards to buy, no mounting of motor—no aligning or adjustment on the job.

6 Install anywhere—on floor, wall, or ceiling. (Many installations are practicable *only* with direct-connected blowers). 64 different discharge arrangements. Direction of rotation quickly and easily changed.

7 Powered by **all-Ilg-built motors** specifically designed for air-moving applications, each Ilg Direct-Connected Blower is covered by a "ONE-NAME-PLATE" guarantee, including *both* motor and blower . . . assures *undivided responsibility!*



ARMY E NAVY

SAVE MONEY EVERY DAY—with wheel mounted directly onto motor drive shaft, Ilg Direct-Connected Blowers have a single moving unit rotating on heavy-duty, grease-packed, anti-friction ball bearings. Nothing to get out of alignment or wear excessively . . . no belts or pulleys to be replaced . . . no daily waste of electricity from indirect transfer of power . . . no need for constant adjustment and dressing of belts. You save all along the line . . . on installation . . . on servicing . . . on maintenance. . . . Phone nearby Ilg Branch Office (see classified directory) or send today for FREE booklet.

ILG ELECTRIC VENTILATING COMPANY
2885 N. CRAWFORD AVE., CHICAGO, ILLINOIS
OFFICES IN 39 PRINCIPAL CITIES

ILG

VITALIZED VENTILATION

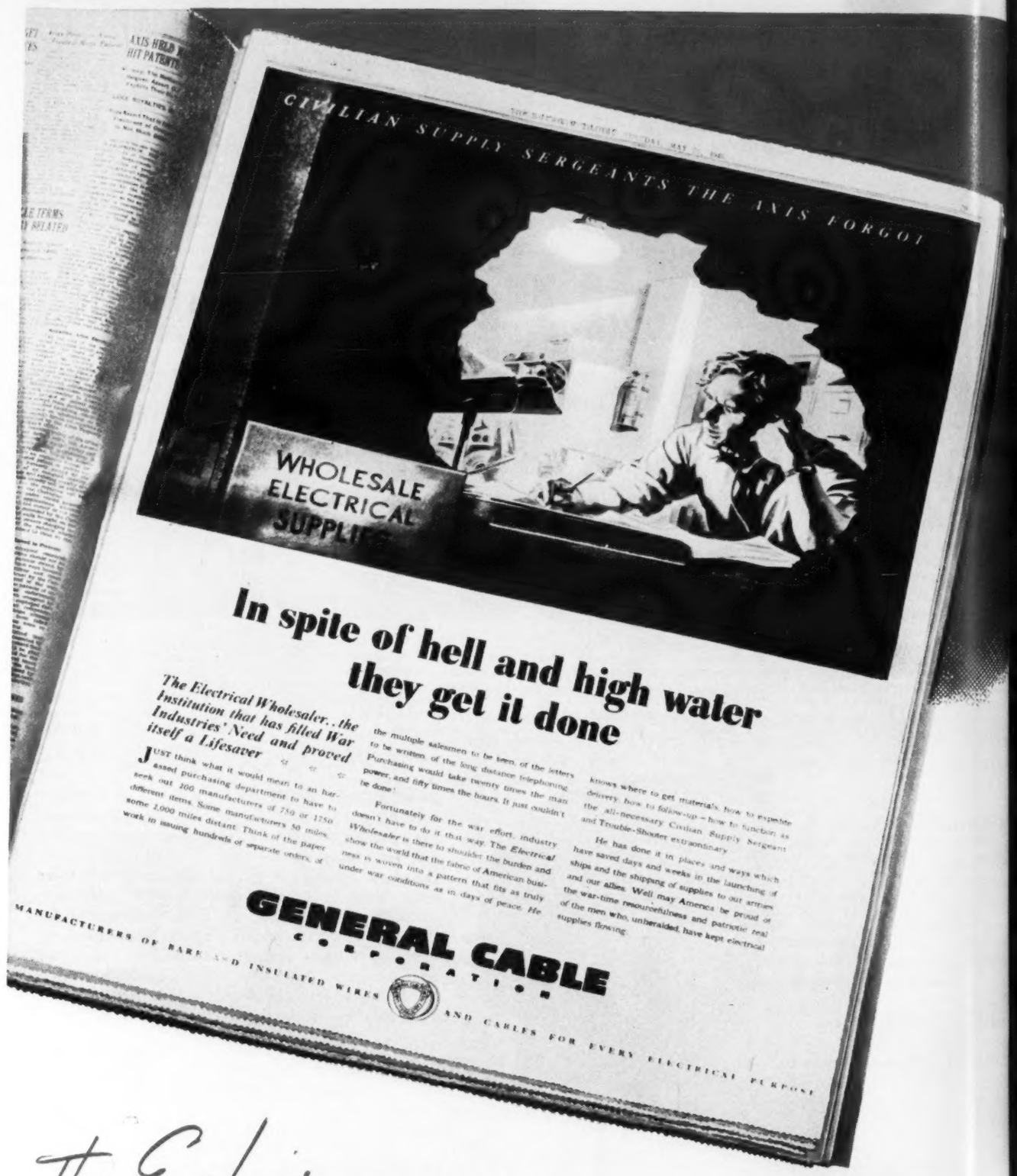
AIR CHANGE . . . NOT JUST AIR MOVEMENT!

SEND FOR* FREE *BOOKLET

On last page of this special section you will find a convenient inquiry form. Check and mail now for your FREE copy of this handy pictorial catalog and data book featuring the complete Ilg line of Self-Cooled Motor Propeller Fans, Universal Blowers and Units Heaters. Or write us about your special wartime heating and ventilating problem. Act today!

FOR TOMORROW'S BETTERMENTS

GraybaR QUALITY Since 1869 — Everything Electrical — GraybaR ELECTRIC COMPANY


CIVILIAN SUPPLY SERGEANTS THE AXIS FORGOT
WHOLESALE ELECTRICAL
In spite of hell and high water they get it done
The Electrical Wholesaler . . the Institution that has filled War Industries' Need and proved itself a Lifesaver
JUST think what it would mean to an harassed purchasing department to have to seek out 200 manufacturers of 750 or 1250 different items. Some manufacturers 50 miles, some 2,000 miles distant. Think of the paper work in issuing hundreds of separate orders, of the multiple salesmen to be seen, of the letters to be written, of the long distance telephoning. Purchasing would take twenty times the man power, and fifty times the hours. It just couldn't be done!
Fortunately for the war effort, industry doesn't have to do it that way. The Electrical Wholesaler is there to shoulder the burden and shows the world that the fabric of American business is woven into a pattern that fits as truly under war conditions as in days of peace. He knows where to get materials, how to expedite delivery, how to follow-up — how to function as the all-necessary Civilian Supply Sergeant and Trouble-Shooter extraordinary.
He has done it in places and ways which have saved days and weeks in the launching of ships and the shipping of supplies to our armies and our allies. Well may America be proud of the war-time resourcefulness and patriotic zeal of the men who, unheralded, have kept electrical supplies flowing.
GENERAL CABLE
CORPORATION
MANUFACTURERS OF BARE AND INSULATED WIRES AND CABLES FOR EVERY ELECTRICAL PURPOSE

The Emphasis of General Cable's recent national newspaper campaign spotlights first one, then another of the service industry groups. Included in this series are messages relating to the war-time performances of the Electrical Wholesalers, of which this is typical.

FURTHER ADVERTISEMENTS, OUTLINING THE WHOLESALERS' FUNCTION IN WAR AND IN PEACE, ARE BEING SCHEDULED.

GraybaR Since 1869 Everything Electrical . . . . THAT IT TAKES TO WIN!

. . . FOR TODAY'S ESSENTIALS

INE CONSTRUCTION
UCKS AND EQUIPMENT
OR EVERY UTILITY
NEED....

Write for literature describing the complete line of FWD Trucks and Utitlity Tools:

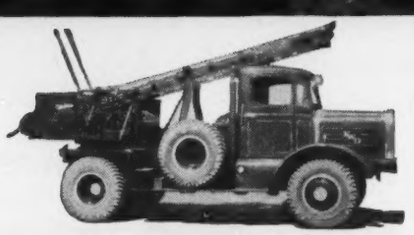
- Line Bodies for Every Requirement
- Cable Reel Trailers
- Pole Trailers
- Collapsible Power Reels
- Towing and Pintle Hooks
- Earth Boring Machines
- Strand Pay-Out Jacks
- Trailer Hitches
- Water Casks
- Drawbars
- Cable Laying Plows
- Winches
- Power Take-Offs
- Cable Splicer's Carts
- Low Bed Trailers
- Heavy Duty Pole Trailers
- General Purpose Trailers
- Wire Pick-Up Reels
- Steel Utility Bodies for Pick-Up Trucks
- Truck Supports
- Winch Line Hooks
- Safety Hooks
- Derrick Hold-Down Clamps
- Tail Bolt Assemblies
- Tru-Lay Wire Cable
- Guy Wire Forming and Cutting Tools
- Derricks

The Utility Division of THE FOUR WHEEL DRIVE AUTO CO.
CLINTONVILLE, WISCONSIN

FWD TRUCKS

...FIRST CHOICE OF MORE THAN 150 PUBLIC UTILITIES

profitable investment if you use
ur FWD just one hour per day.



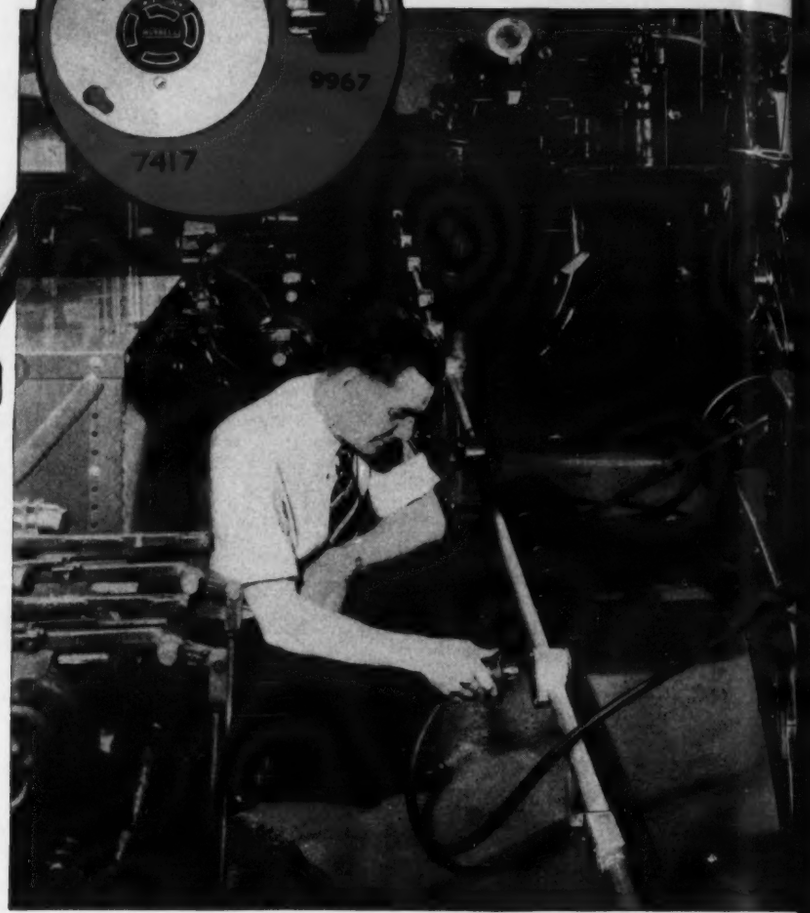
Typical borer unit as incorporated into original FWD design.

Typical FWD line construction and maintenance truck.

*GraybaR
Everything Electrical
*GraybaR ELECTRIC COMPANY
SINCE 1869
*REG. U.S. PAT. OFF.

HUBBELL *Twist-Lock* DEVICES

They never disconnect accidentally!



FOR UNINTERRUPTED PRODUCTION IN DEFENSE PLANTS

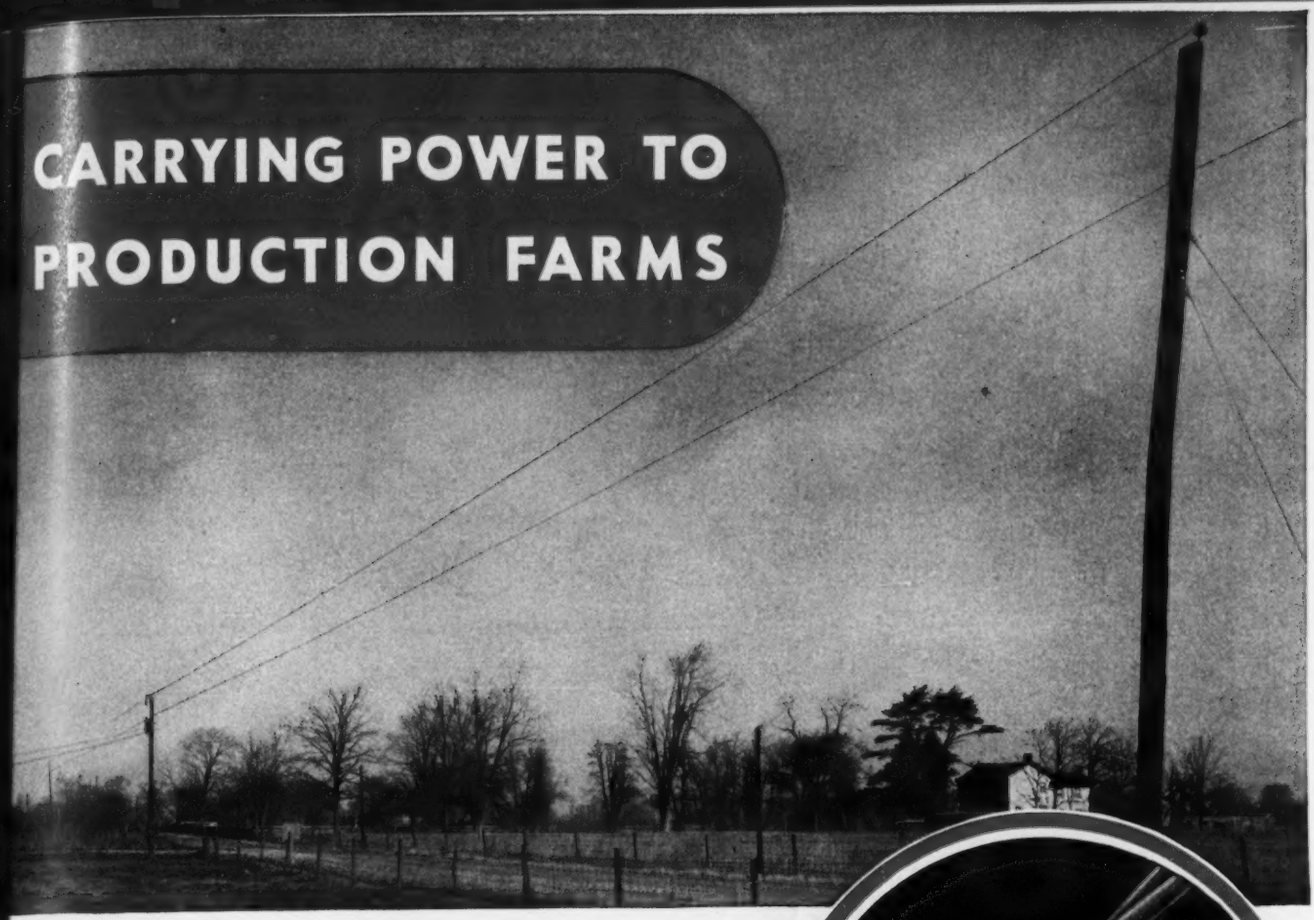
Twist-Lock **Devices eliminate time-losses and annoying delays because they "stay put"—are vibration-proof—assure a lockfast electrical connection under the most trying conditions —are available polarized and grounded for safe operation!**

HARVEY HUBBELL, INC. HUBBELL REG. U.S. PAT. OFF. BRIDGEPORT, CONN.

Graybar SINCE 1869 * REG. U.S. PAT. OFF.

Everything Electrical . . . . THAT IT TAKES TO WIN!

. . . FOR TODAY'S ESSENTIALS



Crapo
STEEL CONDUCTOR

Thousands more of the nation's food producing farms will be electrified in 1943 because of *Crapo* Steel Conductor. For this conductor material—conceived during World War I, perfected and proved in during the peace years—was ready to meet the current war emergency.

Crapo Steel Conductors, developed specifically for the overhead transmission and distribution of power, provide a combination of physical properties and electrical efficiency never before obtained in ferrous wire.

Extra high tensile strength makes possible long spans with flat sags and greater ground clearances, reduces the number of pole structures required, saves critical materials and man-hours.

Electrically, *Crapo* Steel Conductors are unique because of their low 60-cycle resistance, low magnetic permeability and low 60-cycle reactance.

For rural extensions authorized by Utilities Order U-1-c, specify No. 6 B.W.G. *Crapo* HTC-130 Stranded (3-wire) Conductor—the size and type recommended for the purpose. Ask the Graybar representative or contact the nearest Graybar office!

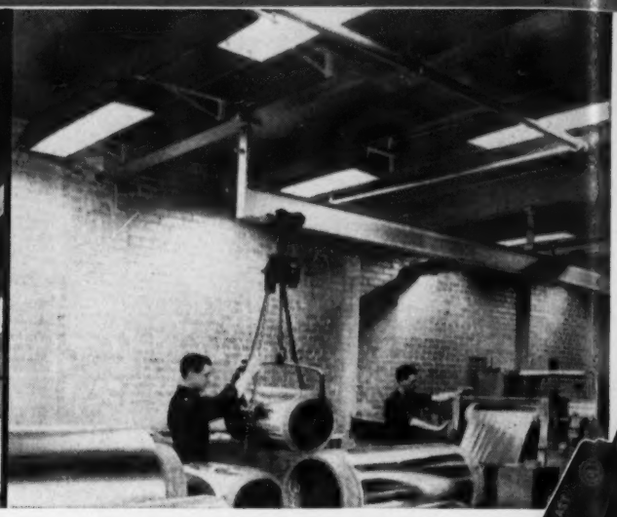
A new engineering manual, containing complete technical information about *Crapo* Steel Conductors, will be mailed on request.

INDIANA STEEL & WIRE COMPANY . . . . . MUNCIE, INDIANA

FOR TOMORROW'S BETTERMENTS

*Graybar QUALITY SINCE 1869 *REG. U.S. PAT. OFF. Everything Electrical *Graybar ELECTRIC COMPANY

AIDS TO DEPENDABLE LIGHTING

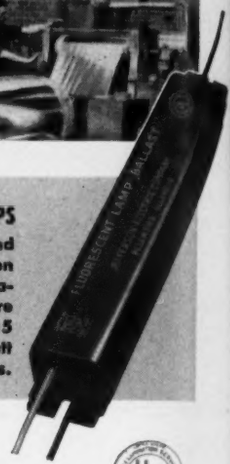


TRANSFORMERS FOR MERCURY LAMPS

For high bay lighting—for mercury lamps wherever used—Jefferson Electric ML Transformers insure maintained high efficiency of lamp performance. They are designed to govern the starting and operating cycles of this type of lighting unit.

BALLASTS FOR FLUORESCENT LAMPS

In thousands of war production plants and in every section of the country, Jefferson Electric Ballasts are proving their capability in long-hour service. They are made in single and two-lamp types, 15 to 100 watts; 3-lamp type for 40-watt lamps; 4-lamp type for 100-watt lamps.



CERTIFIED ETL SPEC NO 6 HIGH P.F.

● Because all production is dependent on electricity—care used in the selection of the accessory devices will pay you big dividends in satisfactory uninterrupted service...These include the Transformers used with mercury lamps, the Ballasts that serve the fluorescent lamps,—the Power Circuit Transformers that provide the 115-230 volt current for lighting and small electrical appliances,—and the Fuses that protect lighting systems, motors and other electrical equipment.

By specifying "Jefferson Electric" you are assured the dependable performance so important in our continued war production effort. JEFFERSON ELECTRIC COMPANY, Bellwood, (Suburb of Chicago) Illinois. *Canadian Factory:* 60-64 Osler Avenue, W. Toronto, Ont.

RELIABLE PROTECTION OF LIGHTING AND POWER SERVICE

To prevent unnecessary shutdowns—to guard against damage to motors and other electrical equipment—is the job experienced electrical men turn over to Jefferson-Union Fuses. Since the earliest days of the electrical industry they have been known for their uniform accuracy and reliability. Specify them by name.

POWER-CIRCUIT TRANSFORMERS

To save copper, conduit, installation time and expense—modern practice dictates the distribution of 460-580 volt circuits for power—and tapping these circuits to supply 115-230 volts for lighting and small appliances. Jefferson Power-Circuit Transformers are employed where this lower voltage is desired.

JEFFERSON ELECTRIC

TRANSFORMERS ★ BALLASTS ★ FUSES

. . . FOR TODAY'S ESSENTIALS

Graybar Everything Electrical . . . . THAT IT TAKES TO WIN!
Since 1869
REG. U.S. PAT. OFF.

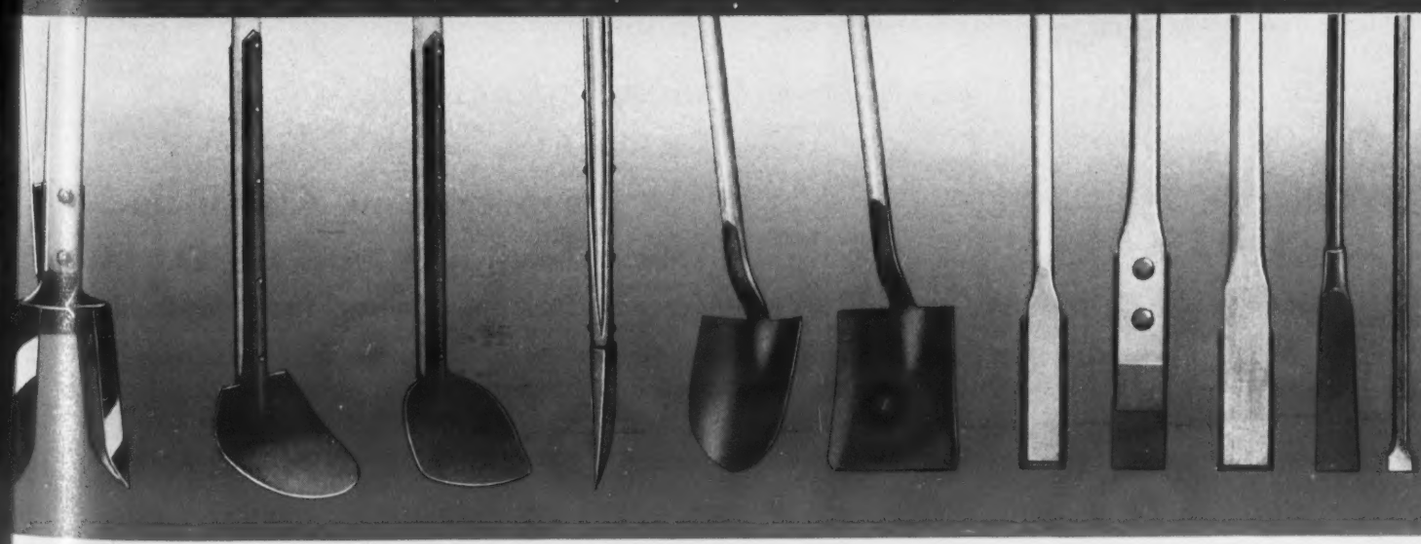
Front Lines!

There are many vital "front lines" on America's home front. Among the most vital, perhaps, are the lines of communication—the lines of light and power distribution.

The job of keeping these lines open and in good repair is vital to Victory. Therefore, make certain you have a complete stock of line maintenance tools on hand to meet any possible emergency.

OSHKOSH TOOLS

LEACH CO. • OSHKOSH, WIS.



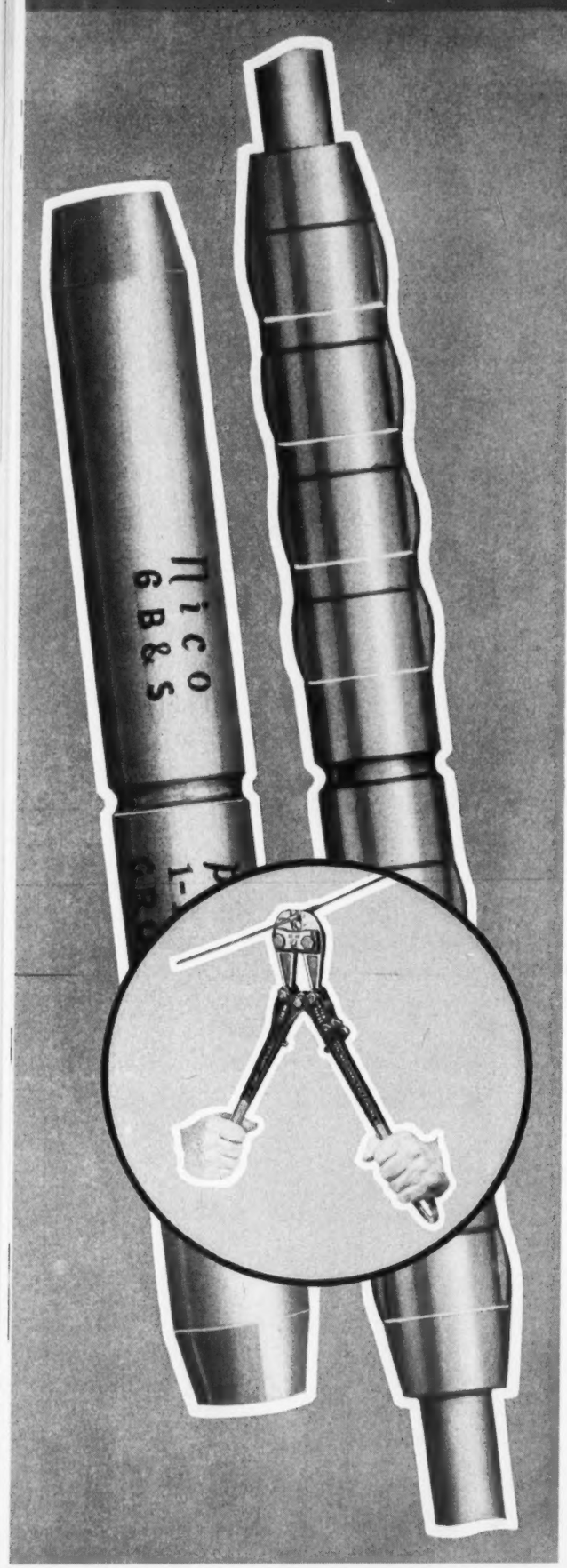
FOR TOMORROW'S BETTERMENTS

*GraybaR Everything Electrical *GraybaR ELECTRIC COMPANY

. . . . The *Modern* Splicing Method—

Nicopress

SPLICING SLEEVES



Some of the reasons why Nicopress Sleeves are unexcelled for making joints on Power Distribution Lines are:

- Ease and speed with which the compression splice can be made, either in the air or on the ground.
- The great strength and tightness of the splices.
- All Nicopress splices are neat in appearance and are but slightly larger in diameter than the wire.
- As all Nicopress Power Sleeves are bevelled at both ends they pull easily over the crossarms without snagging.
- In making the Nicopress splice the wires meet end to end in the sleeve without bending or distortion. This not only assures great strength but means a conservation of material and permits splicing broken lines without changing sag.
- And not least important in these war times, splicing wire and concentric cable with Nicopress sleeves is the easiest way to conserve odd lenaths and make them usable.
- Nicopress Tools used for compressing the sleeves are exceedingly easy to operate and convenient to use even on the poles amongst the wires and close to the crossarms.

Nicopress Sleeves are available in a wide range of sizes for Copper, Copperweld and steel wire, solid and stranded.

The *Nicopress* Line Also Includes:

Reducing Sleeves, Repair Sleeves, Sleeves for Splicing Concentric Cable and Offset and Suspension Dead-Ends

•

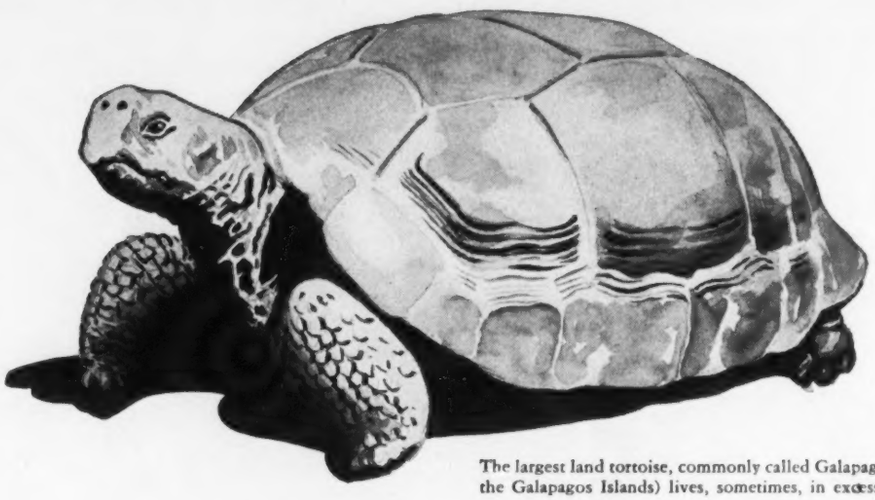
THE NATIONAL TELEPHONE SUPPLY COMPANY

5100 SUPERIOR AVENUE • CLEVELAND 3, OHIO

*GraybaR
Since 1869
*REG. U.S. PAT. OFF.
Everything Electrical
. . . . THAT IT TAKES TO WIN!

. . . FOR TODAY'S ESSENTIALS

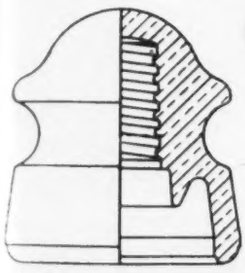
LONG LIFE!



The largest land tortoise, commonly called Galapagos (after its home in the Galapagos Islands) lives, sometimes, in excess of 100 to 150 years.

Even if he lives to be 175 . . . A Hemingray Glass Insulator can *Outlive Him*

There are three reasons for the long life of Hemingray Insulators. First, the "secret" glass batch-mix—climax of 87 years of experience. Second, the Owens-Illinois quality-control of production. These result in insulators without voids, stresses or strains—so homogeneous that they are impervious to moisture-penetration and operating temperature changes. And third, the fact that time does not affect their structure. You could remelt a 100-year old Hemingray glass insulator and make it into another insulator which in turn, would last another 100 years. Cost is low to begin with—*lower* in service-life. Hemingrays are sold *only* through jobbers.

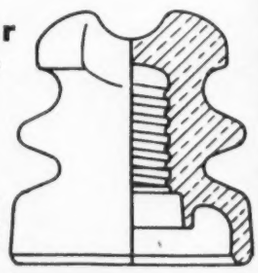


Hemingray Insulators for Primary Power

There are 10 Hemingrays made for primary power distribution. From this group you can choose Insulators with the following range of characteristics:

***Critical Impulse Flashover* ranging from 75 to 120**
***Leakage Distances* ranging from 4 to 9½ inches**
***Dry Arcing Distances* from 2⅜ to 4⅝ inches**
***Wet Arcing Distances* from 1 to 1¾ inches**

There are also 10 Hemingrays for Secondary Power Distribution with the following range of characteristics: *Heights* ranging from 2 15/16 to 5 1/32 inches. *Diameters* ranging from 2¼ to 3¼ inches. *Groove Diameters* ranging from 1 to 2 inches. Thread Diameters at 1 inch in all 10 Numbers.



OWENS-ILLINOIS

HEMINGRAY DIVISION • MUNCIE, INDIANA

FOR TOMORROW'S BETTERMENTS

How to Cut Corners In Line Construction Without Cutting Corners On Quality

Distributed by GraybaR ELECTRIC COMPANY

Ohio Brass

MANSFIELD, OHIO

CANADIAN OHIO BRASS CO., LTD., NIAGARA FALLS, ONTARIO

There's a lot of know-how in making insulators and line hardware. This class of material distributed by Graybar is a product of the Ohio Brass Company, one of the leaders in the electrical industry. Ingenious designs that save time and labor are based on long experience. Materials are the same as employed in the highest voltage applications. They add up to all-around satisfaction. And the difference between time-proven materials and unknown "bargains" is so slight that just one trouble call will wipe it out. You won't make that call when you build with O-B. Get these materials from Graybar--as handy as your 'phone.

2439-H

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

GraybaR Since 1869 *REG. U.S. PAT. OFF. Everything Electrical . . . . THAT IT TAKES TO WIN!

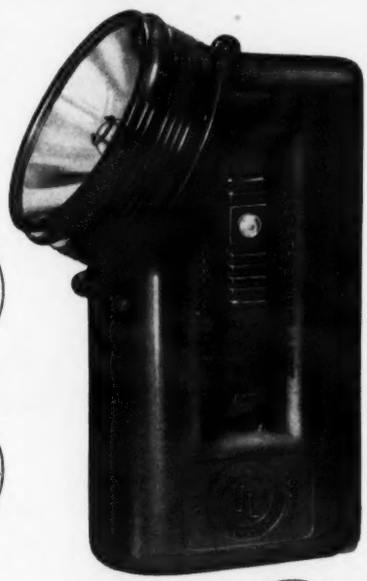
. . . FOR TODAY'S ESSENTIALS

2 Leaders IN AN OUTSTANDING LINE OF

JUSTRITE *Electric Lanterns*

⬅ INDUSTRIAL AND MARINE SAFETY TYPE

No. 42-S Approved by UNDERWRITERS' LABORATORIES, INC. for safe use in Class 1, Group D locations. Approved by U.S. BUREAU OF MARINE INSPECTION AND NAVIGATION for use in Pump Rooms of Tank Vessels. Has movable stand which serves as guard. Movable handle, clear glass globe, "throw-out" type bulb sockets. Furnished with one 5-volt .3 amp. bulb and one 5-volt .15 amp. bulb, and uses any regular 6-volt lantern battery. Switch and principal parts are easily removed and replaced, permitting quick adjustments or repairs. Body of lantern is 21-gauge steel.



The New JUSTRITE SERVICE LIGHT ➡

No. 17-S The lightweight plastic Electric Light with the famous Justrite Safety and service features. Approved by Underwriters' Laboratories for use in Class 1, Group D locations and by the U.S. Bureau of Mines for use in methane gas and air mixtures. Uses 3 standard size D dry cells to give 1500 candlepower beam which can be focused. Signal flasher in easily replaced switch. Can be carried upright by belt clip, reversed (for blackouts) by finger ring or stood on flat surface. See it today.

Railroad Type No. 40

Inspector's Lantern No. 46-W

JUSTRITE LANTERNS FOR EVERY USE

Today, industry is straining for production — without stoppages! So, there's unceasing demand for standard Justrite products. These sturdily built items with their nationally known safety features never sold at greater volume. And in 194X there'll be new items (new, but familiar to millions of men) to fill present needs, but better! Keep your eye on Justrite!

All-Purpose Safety Type No. 40-S

Headlight Lantern No. 83

JUSTRITE MANUFACTURING COMPANY

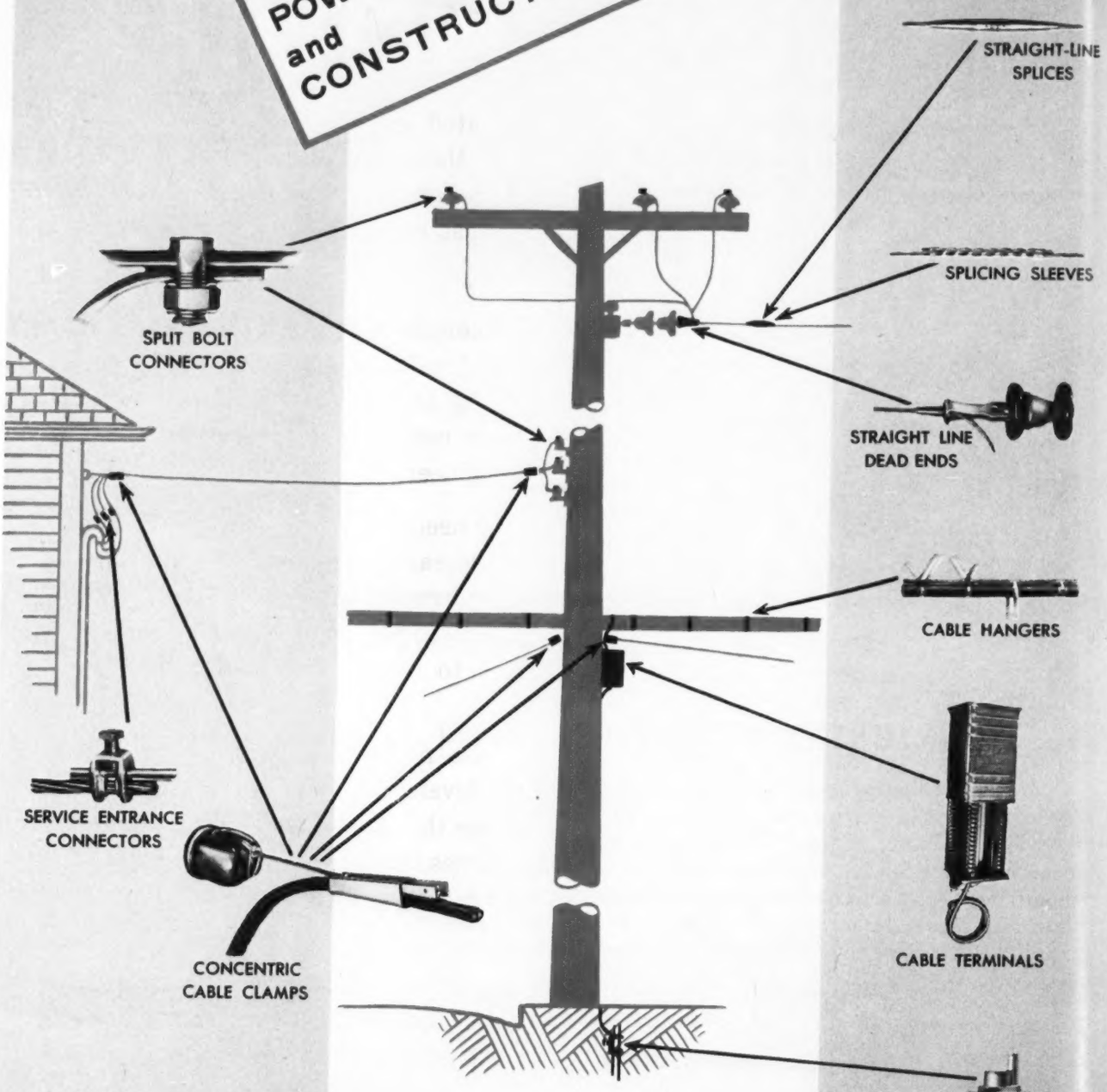
2080 N. Southport Avenue, Chicago, Ill.

FOR TOMORROW'S BETTERMENTS

GraybaR Everything Electrical GraybaR ELECTRIC COMPANY

Reliable

POWER-LINE CONNECTORS and CONSTRUCTION SPECIALTIES



Reliable

ELECTRIC COMPANY

3145 CARROLL AVENUE • CHICAGO

GraybaR

Everything Electrical

. . . . THAT IT TAKES TO WIN!

. . . FOR TODAY'S ESSENTIALS

SIMPLEX WIRES AND CABLES *After the War*

YOU may have wondered how insulated wires and cables that you will buy after the war will differ from those that have served you so well. No one knows all the answers but we can make some predictions about Simplex wires and cables, based on past experience and present developments.

SINCE 1885 Simplex has devoted all its energies to providing insulated wires and cables needed by the rapidly expanding electrical industry. Our aim has been not only to meet requirements by keeping abreast of industry development but, if possible, to anticipate its needs. Simplex in this has earned a reputation as a pioneer in cable engineering.

The adjustments made necessary by military needs and the unusual demands of war-time industry always have stimulated research and led to better products for commercial use later. The present emergency is no exception. Cable developments now taking place cannot be discussed but definite and important changes are being made which can be adapted to commercial uses when victory has been achieved.

Simplex research and pioneering of the past now enables us to play an important part in many of the present day developments. When the war is over, Simplex will provide for commercial use the improved wires and cables developed during this war. Simplex trade names that have meant quality and service in the past will mean the same again but in greater degree.

Simplex Wire & Cable Co., 79 Sidney Street, Cambridge, Mass.

ARMY E NAVY

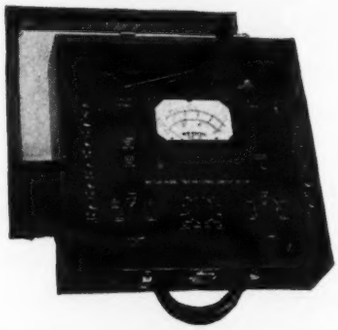
Simplex
WIRES and CABLES

FOR TOMORROW'S BETTERMENTS

GraybaR Everything Electrical GraybaR ELECTRIC COMPANY

Weston *Model 633*
A-C CLAMP AMMETER

—a real *time-saver*, which tests without disturbing circuits or interrupting work. The clamping jaws are simply placed over the conductor or switch blade for current reading.

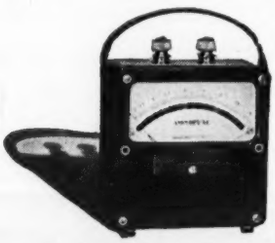


Weston *Model 785*
INDUSTRIAL CIRCUIT TESTER

A highly versatile tester for trouble shooting. Provides voltage, current and resistance ranges for checking motor and control circuits, lighting circuits, sensitive relay circuits, electronic circuits, etc. (D-C sensitivity 20,000 ohms per volt.)

Industry's production figures bear testimony to the outstanding contribution electrical engineers and plant maintenance men are making to war-plant efficiency. Despite obstacles such as materials scarcities and limited manpower, electrical equipment—old and new—is being kept constantly fit for full scale output.

As part of the efficient maintenance combat team the WESTON test instruments illustrated—and others—are playing an important role. For in addition to their *trustworthy indications* on which maintenance has long learned to depend—they also provide features which greatly simplify preventative maintenance procedure. *In less time—at far lower cost*—industry's electrical equipment is being kept *fit* with dependable WESTONS.



Weston *Model 430*
TEST INSTRUMENTS

The universal favorites for active maintenance . . . compact, rugged and with enduring precision. Large scale openings with hand calibrated mirror scales assure quick, accurate readings. Available in A-C and D-C instruments and single phase wattmeters.

Weston *Model 703*
DIRECT READING ILLUMINATION METER

— measures all types of lighting direct, without correction factors—fluorescent, mercury vapor, incandescent, neon, daylight, etc. Made in models and ranges for shop and laboratory needs.

WESTON *Instruments*

Weston Electrical Instrument Corporation, 578 Frelinghuysen Avenue, Newark, New Jersey

Graybar — Everything Electrical . . . . THAT IT TAKES TO WIN!

. . . FOR TODAY'S ESSENTIALS

NEW Wakefield COMMODORE
INDUSTRIAL UNIT

When your're lighting or relighting industrial areas, let these facts help you.

- NEW COMMODORE Industrial unit gives 86% of light from bare bulb . . . 75% down on the job . . . by impartial test of Electrical Testing Laboratories, Inc.
- Plaskon reflector means light weight.
- Only 13 oz. of steel . . . helps WPB conservation.
- Gives light up, as well as down.
- No dark ceilings; no eyestraining contrasts.
- One of the most efficient industrial units known.
- Easy to clean . . . easy to handle.
- For lamps from 200 to 500 watts.

When hell breaks loose at sea...

A hit on ship No. 41 And fire fighters spring to action . . . that's when the new Wakefield Emergency Repairs Light proves its worth. Its portable high intensity beam cuts smoke and steam like a knife . . . helps 'em see better to get at the damage. After the war, it may be your "emergency repairs" light; today, it is available only on orders with government contract number.

For outstanding war production . . . made possible through the untiring efforts of our men and women who make equipment which has helped save fighting ships and men.

ARMY E NAVY

ASK YOUR GraybaR HOUSE ABOUT

LIGHTING EQUIPMENT BY Wakefield

RED SPOT LIGHTING FOR COMBAT OPERATIONS AND WAR PRODUCTION

FOR TOMORROW'S BETTERMENTS

GraybaR Since 1869 *REG. U.S. PAT. OFF. Everything Electrical GraybaR ELECTRIC COMPANY

SOLDERING LUGS

Sherman Drawn Seamless Round End Lugs do not leak solder. Made from highest grade electrolytic copper. Also 2-hole and 4-hole square end heavy duty lugs.

SPECIAL LUGS

Angle, center formed, special length, plated finish, etc., can be made to order promptly.

Sherman Electrical Fittings

● ***Help Deliver the Power that's Winning the War for America***

America's utilities are doing a great job of meeting the unprecedented demands for power on the production front. We are glad that we are privileged to help by supplying the Electrical Fittings used by so many of these utilities.

Sherman Fittings make high conductivity, dependable connections. Precision manufacturing methods, gauge and visual inspections insure uniform quality. Sound engineering design based on 48 years' experience backs every Sherman product. Ease of installation and interchangeability speeds up construction and maintenance installations. Save precious man-hours — specify SHERMAN Fittings.

Ask for Electrical Catalog of items regularly carried in stock — prompt shipment to meet essential needs.

Manufactured by

H. B. SHERMAN Mfg. Co.

Battle Creek, Mich.

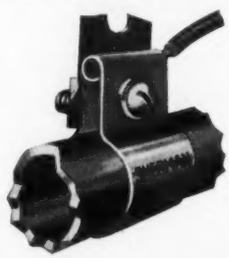
Split Tinned Figure Eight Seamless Oval

SPLICING SLEEVES

These Sherman Splicing Sleeves give your workmen the finest of material with which to make strong, permanent, corrosion-free joints. All sleeves made to accepted standards of the electric utility trade, stamped for identification, and carefully packed. For uniformity and unfailing dependability, standardize on Sherman sleeves.

SOLDERLESS LUGS

Installed in a jiffy, to make tight, permanent connections! Extra thread plate for strength. Floating pressure pad attached to screw. Serrated gripping surfaces.



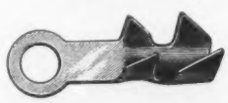
GROUND CLAMPS

A complete line of copper ground clamps and ground fittings. In this one line you can find the right clamp for every job.

SET SCREW CONNECTORS

Made from solid brass rod, all dimensions held to accurate size. Screws heavily rust-proofed. Full range of sizes, all plainly stamped for identification.

TERMINALS



Many special requirements can be promptly supplied, either from stock or made to order.

FUSE CLIPS

Ferrule and Knife-blade types, carefully designed and accurately made. Ferrule types are of special bronze. Knife-blade types are heavy, special temper spring copper.

. . . FOR TODAY'S ESSENTIALS

"WAR-AID" Fluorescent Fixtures by Wheeler...

...offer high-intensity "skilled lighting" for warplants

...conserve critical materials for fighting equipment

Sturdy metal-conserving wiring channel. Non-metallic reflector. Chip-proof, washable reflecting surfaces have reflection factor not less than 84%. Made in 2 and 3 lamp 40-watt units; 2 lamp 100-watt units. Easily adapted for continuous runs. Suspension by "C-clamp" slide hangers, conduit or chain.

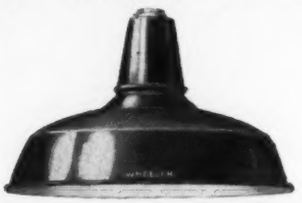
It takes accurate vision by plant workers to maintain the precision standards now demanded on Army and Navy contracts. In any warplant, that means lighting of the most modern, efficient type.

To make such lighting available *in spite of wartime metal shortages,* Wheeler Reflector Company developed "War-Aid" RLM Fluorescent Fixtures. Made with a minimum of strategic materials . . . designed with "know how" gained in over 60 years of specialized experience . . . Wheeler "War-Aid" Fixtures offer the same high-efficiency illumination and installation ease that have always typified Wheeler "Skilled Lighting".

Whether your jobs require fluorescent or incandescent illumination, Wheeler can supply *skilled lighting* to aid precision war production. Write for catalogs on both types. **Wheeler Reflector Co., 275 Congress Street, Boston, Mass.** . . . New York . . . Cleveland. Representatives in principal cities.

Distributed Exclusively Through Electrical Wholesalers

OTHER WHEELER FIXTURES

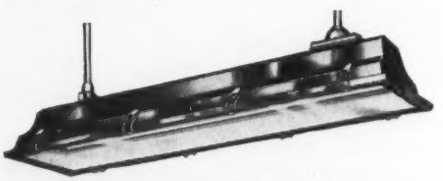


RLM One-Piece Solid Neck Reflectors

Made in Dome, Angle and all other standard types. For indoor or outdoor use.

Wheeler Vapor-Tight Fixtures

Made in all standard pendant and ceiling types. Designed to resist deteriorating effects of vaporous and atmospheric conditions.



Class II-G Dust-Tight Units

Fluorescent fixtures approved for "Class II-G" hazardous locations. Hinged cover protects lamps, sockets and reflecting surfaces. Made for two or three 40-watt lamps.

Wheeler
REFLECTOR COMPANY
LIGHTING EQUIPMENT SPECIALISTS SINCE 1881

FOR TOMORROW'S BETTERMENTS

GraybaR QUALITY Since 1869 *REG. U.S. PAT. OFF.
Everything Electrical
GraybaR ELECTRIC COMPANY

THE location, and the purpose, of this H-Frame line are military secrets, but it will afford no comfort to the enemy to know that the cross arms and the braces were made by American . . . and it will serve to explain a situation.

In Africa, in China, in Alaska, in the Southwest Pacific, wherever Power and Communications are needed for our fighting forces, arms and pins and braces and brackets from American Crossarm and Conduit Co. are in service. These demands have been, and continue to be, enormous, and that's why it's sometimes difficult to take prompt care of non-military requirements.

But every resource of ours . . . and of our distributor, Graybar . . . is being thrown into the effort, and nothing will be left undone to satisfy the needs of the Electric Service Industry.

AMERICAN · CROSSARM
AND CONDUIT COMPANY

General Offices
22 W. Monroe St.
Chicago

Sales Offices
New York, N. Y.
Kansas City, Mo.
Chehalis, Wash.
Texarkana, Texas

RAINIER
WOOD PRODUCTS
TRADE MARK
FOR
OVERHEAD AND UNDERGROUND CONSTRUCTION

Factories
Chehalis, Wash.
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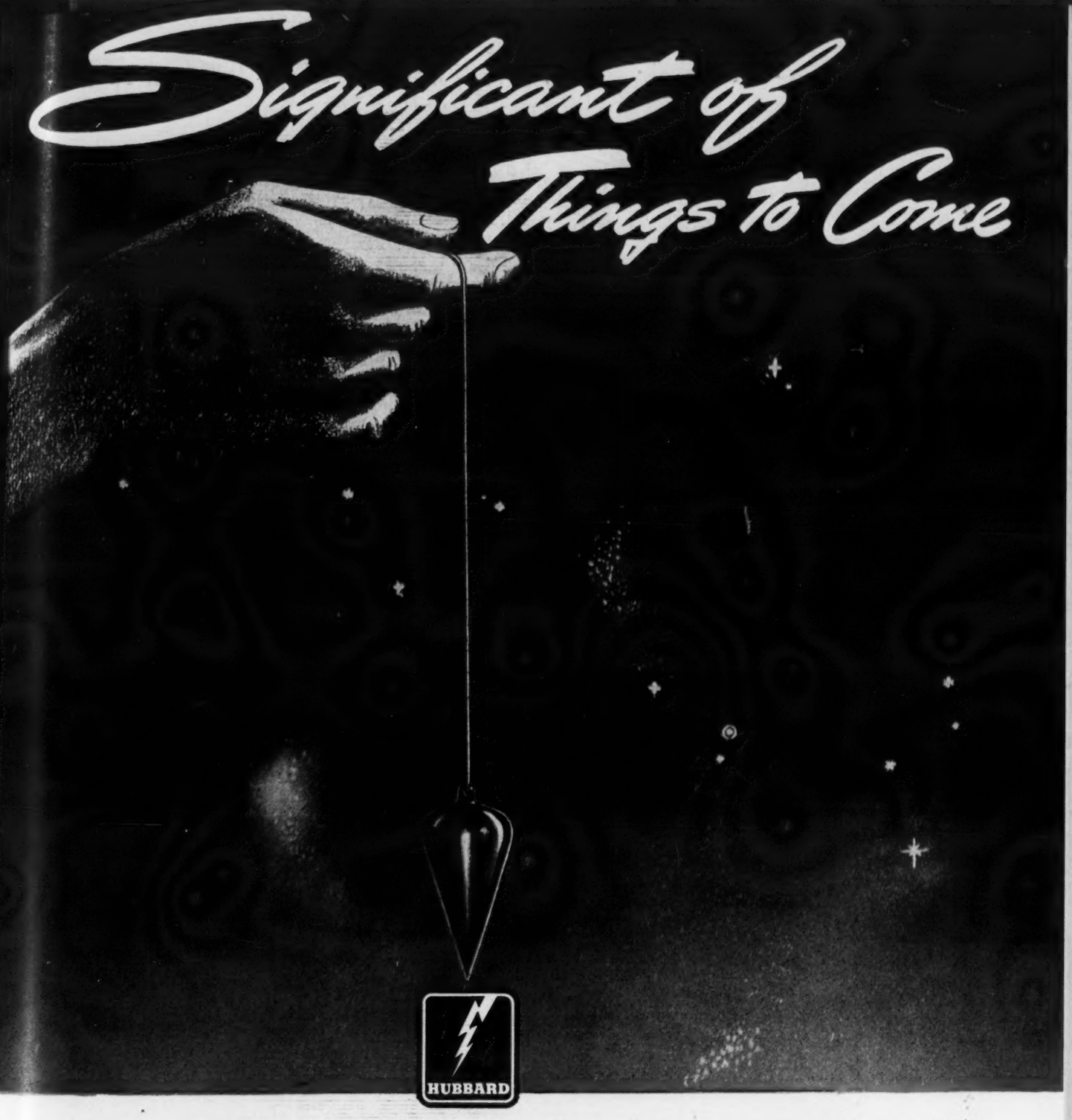
Texarkana, Tex.

Graybar
Since 1869
Everything Electrical
. . . . THAT IT TAKES TO WIN!

. . . FOR TODAY'S ESSENTIALS

Significant of Things to Come



this spot may stand a transmission tower—a gun em-
ement or new factory. It is the preliminary step to
ts of the future. It is symbolic of the state in which
y of your suppliers find themselves at this time; going
the top on war production but with an eye cocked on
future.

t of the men and machines of the three Hubbard fac-
tories have gone into vital war production, but the plumb bob is swinging, settling down to mark a spot for future development. New designs of Pole Line Hardware are coming. New equipment is being readied to test new principles.

Big things are "in the making". Watch for them, and in the meantime; "Maintain that load on Hubbard Hardware."

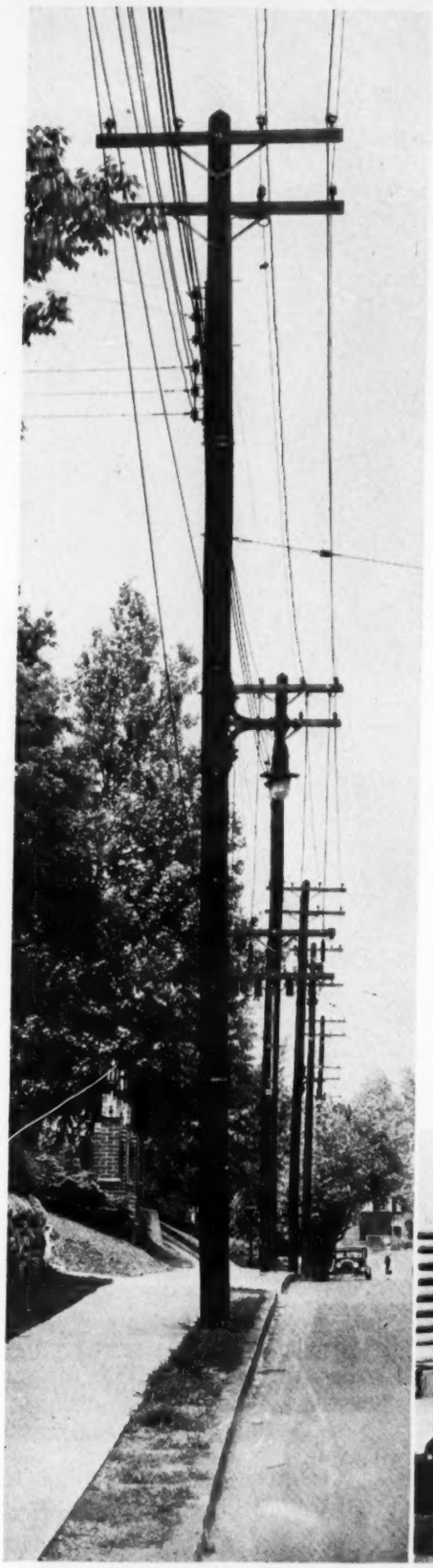
HUBBARD AND COMPANY

PITTSBURGH . . . OAKLAND CALIFORNIA . . . CHICAGO

FOR TOMORROW'S BETTERMENTS

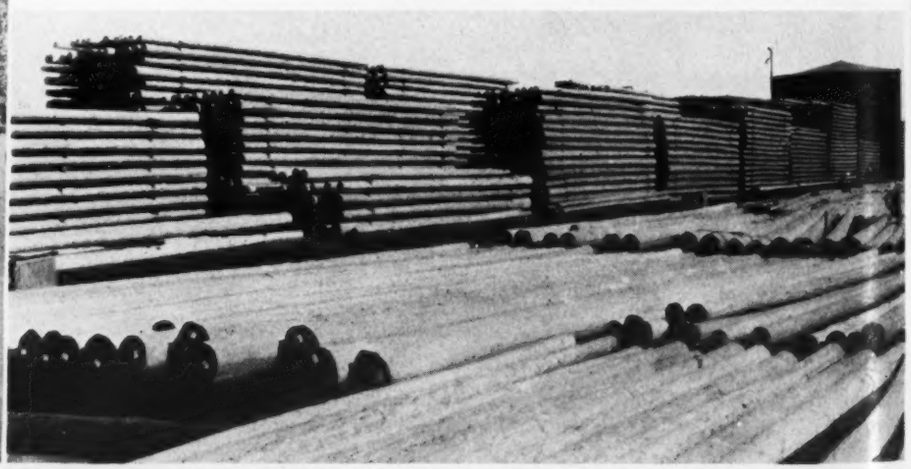
Everything Electrical
GraybaR ELECTRIC COMPANY

DEPENDABLE *Poles* of Selected Sound Timber Scientifically Treated



THE lasting strength of International Creosoted Pine Poles plus their low ultimate cost makes them the safest and most economical poles that can be purchased. For more than 68 years, numerous service records of pole treatments have been utilized to perfect the present production practices for International Creosoted Poles. As a result of the lasting lessons learned during this long experience, International Creosoted Poles will assure trouble-free, continuous service. Their straight, clean, smooth surfaces perfectly adapt them for street lighting, rural and urban distribution.

International Creosoted Pine Poles are manufactured and distributed by two of the oldest companies serving the utility industry. They have grown up together, ready always to serve with quality poles, framed correctly, and shipped when needed.



INTERNATIONAL CREOSOTING & CONSTRUCTION CO.

PRODUCERS OF HIGH GRADE TREATED TIES, POLES, PILES, ETC.

Galveston — Beaumont — Texarkana

. . . FOR TODAY'S ESSENTIALS

88 Convenient Places to buy...

FOR ACTION-SERVICE
ON THINGS ELECTRICAL
CALL YOUR NEARBY
GraybaR
DISTRIBUTING HOUSE

*GraybaR — Everything Electrical . . . . THAT IT TAKES TO WIN!
QUALITY
SINCE 1869
* REG. U.S. PAT. OFF.

Akron	Columbia, S. C.	Hammond	Minneapolis	Portland, Me.	Seattle
Albany	Columbus	Harrisburg	Nashville	Portland, Ore.	Springfield, Mass.
Allentown	*Corpus Christi	Hartford	Newark	Providence	Spokane
Asheville	Dallas	Houston	New Haven	Reading	Syracuse
Atlanta	Davenport	Indianapolis	New Orleans	Richmond	Tacoma
Baltimore	Dayton	Jacksonville	New York	Roanoke	Tampa
Beaumont	Denver	Kansas City	Norfolk	Rochester	Toledo
Birmingham	Des Moines	Knoxville	Oakland	Sacramento	*Tulsa
Boston	Detroit	Lansing	Oklahoma City	St. Louis	Washington
Buffalo	Duluth	*Little Rock	Omaha	St. Paul	Wichita
Charlotte	Durham	Los Angeles	Orlando	Salt Lake City	Winston-Salem
Chattanooga	Flint	Louisville	Peoria	San Antonio	Worcester
Chicago	Fort Worth	Memphis	Philadelphia	San Diego	Youngstown
Cincinnati		Miami	Phoenix	San Francisco	
Cleveland	Grand Rapids	Milwaukee	Pittsburgh	Savannah	*Sales Office

Some of the 60,000 Items Available Through GraybaR

Augers and Diggers, Pole Hole
Aviation, Electrical Equipment
Condulets
Conduit, Iron, Fibre, Clay, Pump Log
Controllers, Automatic Motor
Controllers, Manual Motor
Cord, Heavy Duty
Cord, Rubber Sheathed
Cord, Twisted or Parallel
Crossarms, Fir and Treated Wood
Derricks and Derrick Trucks
Drills, Portable Electric
Fans, Propeller
Fans, Window Ventilating
Fixtures, Ceiling or Suspended Indoor
Fixtures and Fittings, Street Lighting
Generators, Magneto
Globes, Glass
Gloves, Rubber
Hammers, Portable Electric
Hardware, Pole Line
Insulating Materials
Insulators, Glass
Insulators, Glass and Porcelain
Jacks, Cable Reel and Pole
Lamps, Fluorescent
Lamps, Incandescent
Lighting Fixtures, Fluorescent
Lighting Fixtures, Incandescent
Lights, Flood
Lugs, Solderless
Machines, Household Sewing
Marine, Electrical Supplies and Equipment
Motors, A. C. Repulsion
Motors, A. C. Slip Ring
Motors, A. C. Squirrel-Cage
Motors, D. C. Compound
Motors, D. C. Series
Motors, D. C. Shunt
Motors, Fractional Horsepower
Poles, Yellow Pine and Cedar
Posts, Metal Street Lighting
Safety Equipment
Saws, Hand
Signaling Systems, All Types
Strand, Galvanized Guy
Switchboards, All Types
Switches, All Types
Systems, Sound
Tape, Friction
Tape, Rubber
Telephones, Intercommunicating
Tools, Pole Line Construction
Tools, Linemen's
Trucks, Line Construction
Winches, Trailers
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You get an extra assurance of sound construction and up-to-the-minute design . . . now and in the future . . . when you buy from these manufacturers *via* Graybar.

Here's the reason: Graybar, you know, has 74 years of successful electrical distribution behind it . . . and it takes a long-term view of the future when it chooses its supply lines. It's only natural, therefore, that it generally "hooks up" with manufacturers who also have the habit of looking ahead. These are the manufacturers who continue to think about better products even today. Nine times out of ten, they are the firms that lead the way in product improvement.

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NEWS ABOUT PEOPLE

Union Electric Revamps Operating Organization

George K. Miltenberger and Stanley Stokes, veteran operating executives of Union Electric Co. of Missouri, have been named to head two new departments created in a wartime streamlining of the operating organization of the St. Louis utility.

Under the new departments, creation of which was announced by J. W. McAfee, president, and R. E. Moody, vice-president in charge of operation, various functions have been assembled to establish clear-cut lines of responsibility and correlate more effectively the work of generating and distributing electricity in the war emergency and planning for the post-war period, it was stated.

Mr. Miltenberger, 27 years with the company, was named superintendent of production and distribution. Stanley Stokes, who went directly to Union Electric from College in 1912, was advanced to chief engineer.

Mr. Miltenberger has been superintendent of electrical operations, concerned largely with distribution problems. In his new position he will have full control of all seven of the system generating plants, the transmission of the power to substations and its distribution to users. Mr. Stokes, as chief electrical engineer, has been in charge of engineering design of major facilities. As chief engineer he will head the new department of engineering and construction.

George P. Gamble, who joined the company in 1932, becomes superintendent of production, in direct charge, under Mr. Miltenberger's supervision, of the five steam power plants in the St. Louis area and the two hydro-electric plants at Bagnell, Mo., and Keokuk, Iowa. E. H. Tenney, chief engineer of steam power plants, and Albion Davis, chief hydraulic engineer, will continue to function in those capacities, reporting to Mr. Gamble.

Chris H. Kraft, a veteran of 28 years' service, who has been superintendent of distribution, now becomes superintendent of distribution and transmission, directly under Mr. Miltenberger.

To permit Mr. Stokes more time for his enlarged duties, Eugene L. Hough, electrical engineer with the company for 15 years, was advanced to chief design engineer. H. E. Kleffel, superintendent of construction, will work directly under Mr. Stokes, and the drafting division, headed by Carl Rulfs, has been transferred to Mr. Stokes' new department of engineering and construction. The drafting division formerly was a part of the steam engineering department.

"These promotions and changes," Mr. McAfee said, "are in line with the system policy of encouraging the whole supervisory staff to accept greater responsibility in company affairs. The job of helping with the war effort already has placed a great burden on our executive and supervisory staff. After the war we must be prepared to meet entirely new conditions and we must begin immediately to plan how to face these problems. It seems particularly important to make the promotions outlined above at this time."

1. G. K. Miltenberger
2. S. Stokes
3. G. P. Gamble
4. E. L. Hough
5. C. H. Kraft

•

▶ HARRY J. BAUER, president of the Southern California Edison Co., was awarded the honorary degree of doctor of laws by the University of Southern California at the recent graduation exercises in Los Angeles.

▶ ALFRED C. MARSHALL, president of the Detroit Edison Co., was awarded the honorary degree of doctor of arts in business administration at the annual commencement exercises of Wayne University held at Olympia Stadium, Detroit. The citation read in part: "A skillful executive in the field of public utilities administration, he has brought to his high position a philosophy of public service which has won for his company a sound financial status, an abiding public good will, and the deep loyalty of thousands of employees. In a city famous for its benevolent and civic-minded business leaders, he is an outstanding executive and citizen."

▶ B. HUFF has been elected secretary and HAROLD A. PETIT treasurer and assistant secretary of the South Carolina Power Co., Charleston, S. C., succeeding the late Charles J. Bendt, secretary and treasurer of the company for many years. Mr. Huff joined the power company in 1928 as manager of the land and insurance department. Mr. Petit has been identified with the company since 1928 as railway statistician.

▶ RAYMOND KINDIG has been appointed secretary of Pacific Gas & Electric Co. to succeed D. H. Foote and O. H. BARTHOL and WILLIAM FORREST were named assistant secretaries of the company. Mr. Foote, who will remain a member of the board of directors, is retiring from active duties as vice-president and secretary after more than 40 years with the company. He was the

"Seeing Eyes" in the night is the most striking feature of an owl. But such sight is not possessed by many automobile drivers who, because of poor visibility, strike thousands of persons at night. And because more than 57% of traffic deaths occur during darkness, the need for more and better lighting is vitally important . . . especially in dimout areas.

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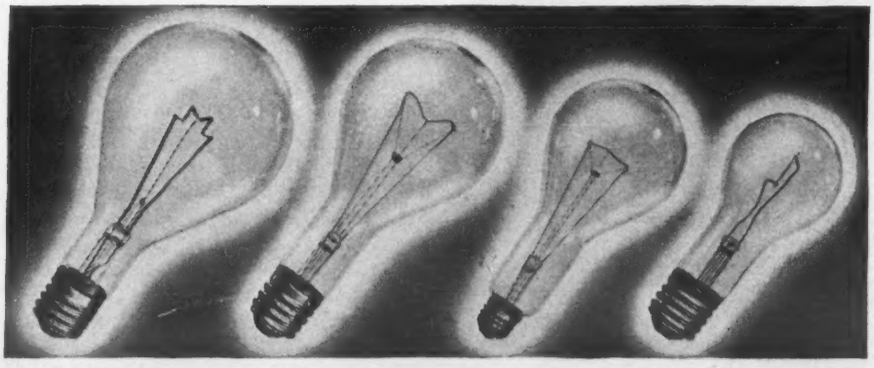

first cashier and assistant secretary of the California Gas & Electric Corp., a predecessor of Pacific Gas & Electric, and in 1907 became secretary of P. G. & E. Fifteen years later he was made a vice-president and in 1927 he was given the additional duties of treasurer. He retired as treasurer earlier this year. Mr. Kindig has been with the company for 29 years, having started as stenographer-bookkeeper in 1914. He had been assistant secretary for nine years.

•

Cleveland Utility Names Kermode Vice-President

John T. Kermode was elected a vice-president of the Cleveland Electric Illuminating Co. at a recent meeting of the company's board of directors. Mr. Kermode has been associated with the company continuously for 50 years. He has been assistant general manager for the past six years.

"For many years Mr. Kermode has been one of the best known and the most valuable men in the electric light and power industry," said Eben G. Crawford, president of the company. "During his 50 years' service with this company he has originated many improvements in the industry which have been adopted nationally. He is a hard worker, a natural leader and a splendid executive, and has thousands of friends both in and outside of the industry. As a vice-president of this company he will be in a position to expand his usefulness to the company, the industry and the public."

Mr. Kermode was employed by the Illuminating company in 1893.

"A great many important things have been accomplished by the electric industry in the past 50 years," says Mr. Kermode, "but the most important of these, in my estimation, has been the outstanding success of our industry in

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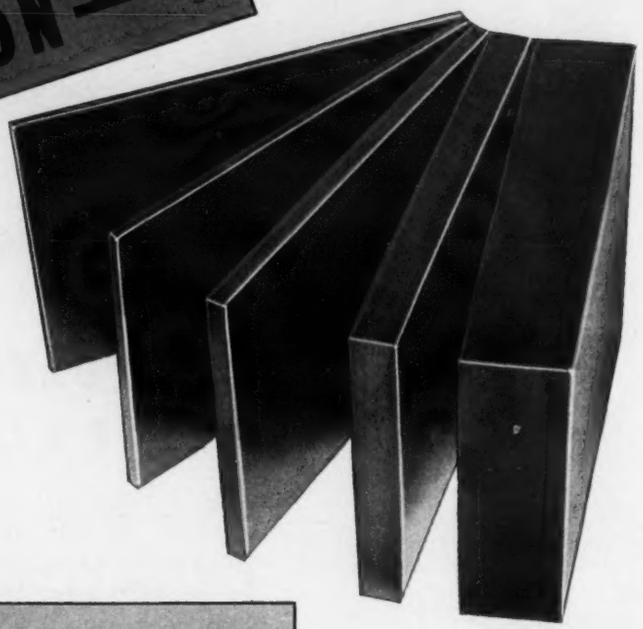
A LAMINATED LIGNIN PLASTIC FOR ELECTRICAL INSULATION . . . .

NON-CRITICAL • PROMPT SHIPMENT

IN ANY QUANTITY FOR IMMEDIATE APPLICATION—



★ If you have a particular electrical insulation problem whether for an entirely new application or for a replacement, find out how LIGNOLITE measures up to your need.

LIGNOLITE has the following important electrical properties vital to dependable and permanent insulation — HIGH MECHANICAL STRENGTH — EXCELLENT ELECTRICAL PROPERTIES — LOW MOISTURE ABSORPTION—HIGH RESISTANCE TO OIL, GREASE, AND DILUTE ACIDS — HIGH DIELECTRIC STRENGTH — HIGH STRENGTH-WEIGHT RATIO AND SUPERIOR ARC RESISTANCE.

Among the many uses for LIGNOLITE are the following — for Clamps and Supports for Busses in Metal Clad Switchgear — Circuit Breaker Bases — Switch Connectors — Insulating Supports — Relay Bases — Switchboards — Panel Boards — Spool Heads — Insulating Washers — to replace Steel in Metal Clad Switchgear — Cabinets to house Electrical Equipment — Name Plates for Electrical Equipment — Terminal Strips, etc.

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Sample of LIGNOLITE and BULLETIN containing specifications and test data sent on request

Sizes Available

LIGNOLITE is available in black color with either a satin or molded sand blast finish. The following sizes are now produced: 46"x46" in thicknesses from 1/64" to 1½"—40"x40" in thicknesses over 1½" to 2"—30"x72" in thicknesses from 1/64" to 1" — 34"x60" in thicknesses from ¼" to 1". Also available — fabricated parts to your specifications.

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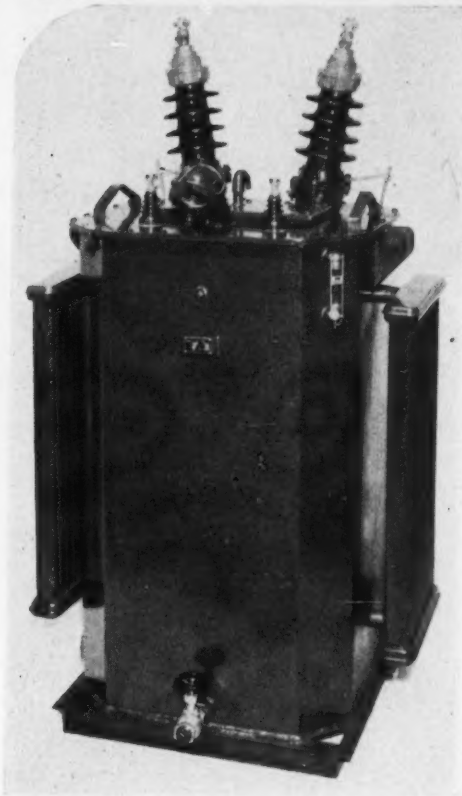

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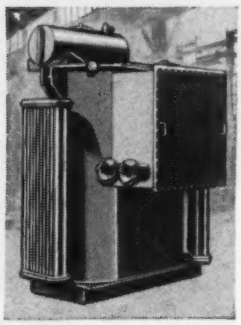
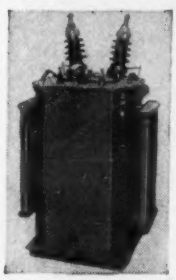
TRANSFORMERS
QUALITY SERVICE



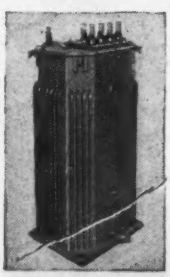
Uptegraff Power Transformer



Uptegraff Standard Type Distribution Transformer—60 cycle, single phase, 33,000 volts primary, 2300 volts secondary, with internal tap changer, high and low voltage discharge gaps; moisture-proof breather and explosion relief.

Uptegraff Standard Type Distribution Transformer, 100 KVA.

Uptegraff Vault Type Distribution Transformer.



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YOUR DATE SETS OUR PACE . . .

Engineering and designing cannot be hurried, specification-tight construction cannot be unduly speeded—but it all can be kept on schedule—fast schedule.

Your date sets our pace, and that pace is gauged to meet your most exacting needs.

If you are an Uptegraff Transformer user, you know "Quality and Service." The same now as ever, with an engineering staff and plant devoted to one purpose—Transformers.

Tell us your needs; we will be prompt.

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SCOTTDALE, PENNA., U.S.A.

meeting the demands for light and power service created by the war.

"Due to the industry's preparedness, there has been plenty of power for war production, a fact that will shorten the war, hasten complete victory and help greatly in solving post-war problems.

"After the war," Mr. Kermode predicts, "America will enter into a new era of electrical living, in which electricity will contribute beyond imagination to production and prosperity, and to health and happiness, throughout what must become a more civilized world."

•

J. D. Leitch Made Chief Engineer of E.C.&M. Co.

John D. Leitch has been made chief engineer of the Electric Controller & Manufacturing Co., Cleveland, Ohio. D. C. Wright, who occupied this position for 16 years, is consulting engineer and also secretary of the company.

A graduate of the University of Glasgow and recipient of a PH.D. degree in physics from the University of

Toronto, Dr. Leitch has been with E.C.&M. Co. since 1937. Prior to, during and after schooling, he was associated for about 15 years with the mechanical engineering and electrical engineering departments of the Steel Co. of Canada with the exception of time-out of four winter periods for study in Scotland. He also did X-ray and radium research in connection with the cancer program for the Ontario government for five years prior to his connection with the Electric Controller & Manufacturing Co.

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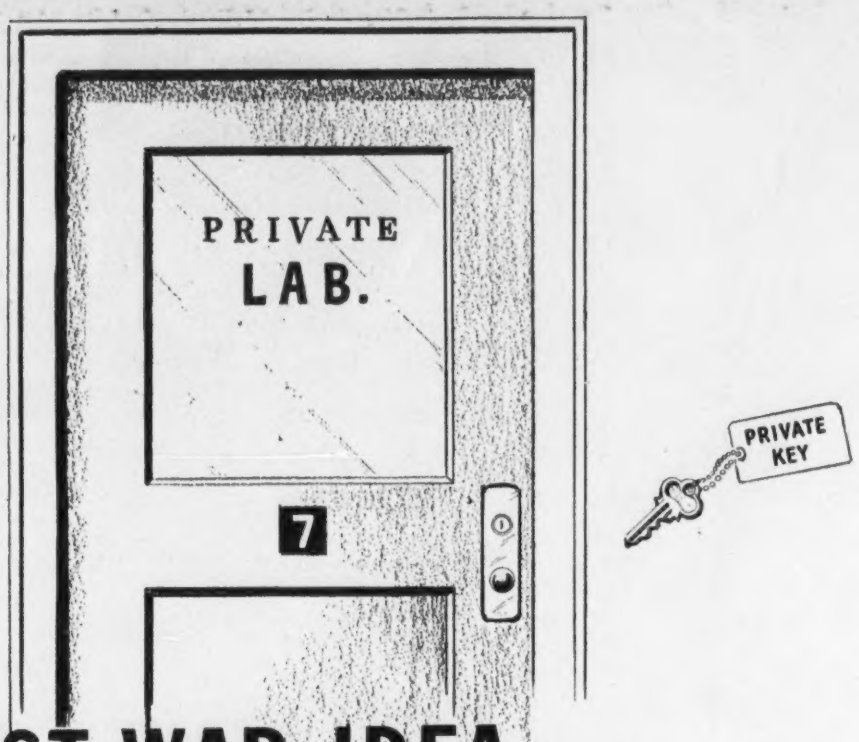
▶ Joseph W. Alsop, for the past 25 years a member of the Connecticut Public Utilities Commission, will retire from the board on July 1. On June 14 he received a silver bowl from 40



YOUR POST-WAR IDEA...

a matter for the Private eye ...before the Public eye

here is scarcely a creative mind in the elec-ical industry which is not developing a post-ar product.

or the period of gestation, E.T.L. leases PRI-ATE LABORATORIES within the ETL uilding

- where men may work in uninterrupted pri-vacy

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In fact those FACTS determine the Figures.

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***STAFF:** More than 150, experienced in test procedure.*

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Education of an ELECTRON...

MORE THAN MEN are being made in this war. "Gadgets" too are finding themselves, learning for the first time some of their own vast potentialities, *getting educated* . . .

Take electron tubes. Right now they're doing a dozen jobs peacetime progress would never have demanded of them—spotting enemy planes, aiming guns, dropping bombs . . .

Like the fighting men whose untiring comrades-in-arms they are, electron tubes are coming home with Victory. They'll be looking for jobs too—jobs to fit the skills they've learned at war!

Then it's going to be up to Yankee ingenuity to put these war graduates to work — heating homes, cooking meals, molding plastics, daylighting factories, melting and treating metals . . .

Yankee ingenuity *will* put them to work —for a better world. And Roebling is working today to that same end. Making the wires and cables—like Paper-Insulated Power Cable, Armored Parkway Cable, Roevar Magnet Wire—that are helping Electronics right now to win this war.

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ELECTRICAL WIRES AND CABLES

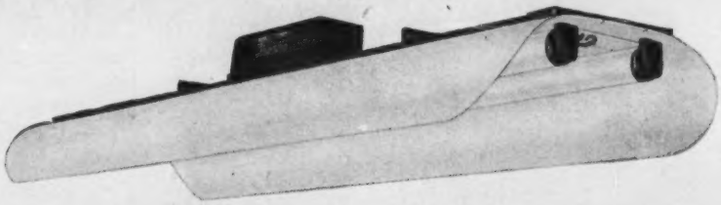
members of the commission staff, master of ceremonies being R. Schneider, secretary and longest-t employee. Mr. Alsop's successor on board will be EUGENE S. LOUGHLIN Greenwich, appointed by Gover Baldwin.

▶ RALPH J. CORDINER has resigned a vice-chairman of the War Producti Board. Mr. Cordiner, a former G eral Electric executive and presid of Schick, Inc., of Stamford, Con when he joined WPB last fall, w brought into the war agency as direct general for war production schedulin His letter of resignation, accepted "r luctantly" by Chairman Donald M Nelson, said that "personal matter necessitated his departure.

▶ W. H. BOOTH, chairman of the boar of the Edison General Electric Appli ance Co., was awarded the honorar degree of doctor of laws by the Un versity of Southern California at th recent graduation exercises in Lo Angeles.

▶ R. M. CHERRY has been appointed assistant manager of General Electric Co.'s industrial heating division. A graduate of the University of Arkansa in electrical engineering, Mr. Cherry became associated with General Electric as a testing engineer and worked in the Schenectady and Pittsfield plants. In 1922 he was named industrial heating specialist at the Philadelphia office. In 1924 he entered the industrial heating engineering department at Schenectady, and later was transferred to the industrial engineering department there. Since 1936 he has been connected with the industrial heating division.

▶ FRANK H. SHAW, president of the Shaw Insulator Co., Irvington, N. J., was made the recipient of the annual John Wesley Hyatt Award for outstanding achievement in the plastics industry at a dinner held in New York on June 17. Mr. Shaw received the award for having developed and perfected the transfer molding of thermosetting plastics, without which the production of many intricate and delicate plastic parts for war and industrial equipment would be impossible. The Hyatt award, established by the Hercules Powder Co., Wilmington, Del., in 1941, is named for John Wesley Hyatt, who is credited with having been the inventor of the first plastic. Mr. Shaw has been closely identified with the plastics industry throughout his career. In 1912 he joined the Shaw Molded Composition Co., which his father, Henry M. Shaw, had founded in 1892. In 1915



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SPEEDS PRECISION WORK . . . REDUCES SPOILAGE

Where dimensions and tolerances are measured in *ten thousandths* of an inch, a mere shadow can mean the difference between the right specifications . . . and spoilage.

That's why glareless, shadowless illumination is so necessary for maximum war production of precision parts and assemblies. In fact, good lighting helps all production, whether in foundry, factory or office.

New Westinghouse Luminaires give this kind of lighting—the high-visibility, modern illumination you need, and they comply with Limitations Order L-78.

The moisture-resistant, nonmetallic reflector is covered with a multi-coat, polymerized finish which provides a reflection factor of 85% or more. And it requires only a "twist-of-the-wrist" to attach or remove this reflector, making it easy to keep clean and at top efficiency. The ballast, now externally mounted, provides power factor ranging from 92 to 99%.

These new Westinghouse Luminaires are available for 2 or 3 lamp, 40-watt and 100-watt, individual or continuous strip installations. Any one of 117 Westinghouse Electric Supply Company Offices and Independent Westinghouse Lighting Distributors will gladly give you full details regarding these luminaires and their installation. Or write Westinghouse Electric & Mfg. Co., Edgewater Park, Cleveland, Ohio, for booklet B-3265.

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When the new developments of this emergency period are available, and you re-equip completely with modern communications systems, remember that you cannot buy better crystals than those produced by The James Knights Co. The men of The James Knights Co. are pioneers in the radio crystal field.

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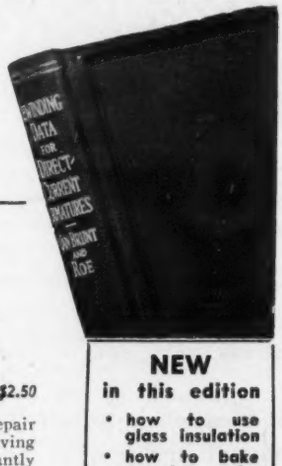
There's more profit in MOTOR REWINDING jobs
when these quick, accurate methods are used . . .



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REWINDING DATA
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Revised, enlarged Second Edition, 277 pages, 6 x 9, 199 illustrations, $2.50

Here is a clear, concise, and practical manual for every electrical repair shop, showing how to rewind d.c. armatures of every type, and giving descriptions, instructions, and data that may be referred to constantly for helps in speeding up the work and assuring satisfactory results.

The book especially emphasizes what data to take when stripping armatures and forms for recording them correctly, to facilitate easy, rapid, accurate rewinding by any member of the shop. Also included is handy information on layout of various windings, insulation methods, and armature-finishing methods. Takes the repair man through all steps—except forming the coils—in rewinding any armature.

NEW in this edition
- how to use glass insulation
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A few of the topics covered:
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- —marking armatures to prevent errors in rewinding and connecting
- —finding the lead throw of armature coils
- —winding and connecting data for some old d.c. armatures
- —cutting out coils in d.c. armature windings
- —synchronous-converter armature windings
- —frog-leg windings for multipolar motors and generators
- —slot and end insulation
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Company .....W. 6-26-43

a new company, the present Shaw Insulator Co., was formed. He held the position of vice-president and general manager until 1936, when he succeeded his father in the presidency. He was one of the original group of men who founded the Society of the Plastics Industry. Mr. Shaw was previously cited by the Ordnance Department for saving aluminum through the use of plastic detonating fuses for 60-mm. and 81-mm. mortar shells.

▶ WILLIAM O. LIPPMAN, works manager of the East Springfield, Mass., plant of Westinghouse Electric, has been appointed manager of the U. S. Naval Ordnance plant at Canton, Ohio, which is operated by Westinghouse for the government. Mr. Lippman is a graduate of Pennsylvania State College and after working for Westinghouse at East Pittsburgh was transferred in 1923 to East Springfield as chief inspector. In 1925 he was made supervisor of industrial relations, and in 1926 returned to the manufacturing division as superintendent of the motored appliance department, later becoming in charge of the air conditioning department. In 1939 he became works manager. JOHN M. HIPPLE, who has been with Westinghouse for 45 years and who was former manager of the headquarters plant in East Pittsburgh, has succeeded Mr. Lippman as head of the East Springfield works of the company. Since 1934 Mr. Hipple has been assistant to the manager of the electric appliance division.

▶ LLOYD J. COSGROVE, San Francisco attorney, has been appointed to the city public utilities commission, succeeding the late Lewis F. Byington. At the time of his death Mr. Byington was chairman of the commission and his term of office continues until 1945. Mr. Cosgrove was born in San Francisco and received his law degree from the institution now known as the University of San Francisco.

▶ DAVID S. HOPPING has been appointed director of sales development of the Celanese Celluloid Corp., plastics division of Celanese Corp. of America. Mr. Hopping, who was formerly director of sales of the packaging division of the corporation, will be responsible for advertising, publicity, sales promotion and sales training. W. RICHARD DONALDSON, formerly with Turck, Hill & Co., has been appointed director of market research. The packaging division has been expanded to handle the sale of all plastic films and foils of the company's manufacture. WILLIAM F. CULLOM, formerly a sales representative in several of the company's divisions, has been appointed director of sales of the films and foils division.

A zinc coating . . .

straight from ORE to WIRE!

Right now the zinc-smelting mills of the nation are carrying a terrific load, trying to keep up with war demands for refined zinc.

When you use bethanized strand you help to lighten this load. A bethanized coating is produced direct from the ore itself. No smelting is necessary. The electrolytic bethanizing process refines the ore into 99.9+ per cent pure zinc at the same time that it locks that pure zinc to the wire.

Furthermore, the bethanizing process applies not only a Class "A" coating, of weight equivalent to Extra Galvanized, but also coatings that are considerably heavier. The bethanized "B" coating is twice as heavy as specifications call for in a Standard Extra Galvanized or Double Galvanized coating. The bethanized "C" coating is three times as heavy. Since the bethanizing process uses ore as its raw material instead of refined metallic zinc, no restrictions have been placed on the coating weight.

As tests conducted by the American Society for Testing Materials clearly indicate that the life of a zinc coating is at least proportional to its weight, this means you can expect *double* and *triple* service life from the heavy bethanized "B" and "C" strand coatings.

Bethanized strand is made in all standard sizes and strengths, including the high-strength grade. The heavy bethanized coatings are particularly advantageous around war plants, or in railroad yards, where smoke and fumes are severe and extra protection against corrosion is necessary. The extra cost of bethanized "B"- and "C"-coated strand is compensated for many times over in increased service and lowered maintenance cost.

BETHANIZED STRAND

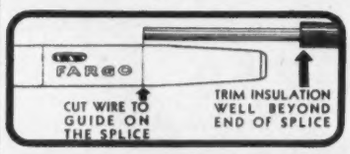
BETHLEHEM STEEL

FARGO LINE SPLICE

Four separate jaws inside the Fargo splice provide a perfect "fit" around the wire; each jaw bites into the wire with a grip that won't let go. All copper shell, Everdur jaws and phosphor bronze spring insure the durability of this greater Fargo gripping power.

Convenient too. Sag Guide shows you how much wire goes inside the splice, tells you in advance the sag the line will have after splicing . . . side holes in the shell admit a screw driver tip for quick release of conductors.

Next time, splice with Fargo.



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OBITUARY

J. C. Gaylord

J. C. Gaylord, superintendent of hydro generation for the Southern California Edison Co., died suddenly on June 2. He was stricken with a heart attack near his home in San Marino and passed away immediately.

A veteran of 31 years of Edison service, Mr. Gaylord was one of the Southern California Edison Co.'s most capable engineering executives. He was prominent in the company's engineering design work for many years and made many contributions to the development of its substation and hydro-electric systems.

Born in Clinton, Conn., in 1884, Mr. Gaylord three days after his death would have attained his 59th birthday. He attended Throop Polytechnic Institute in Pasadena (now the California Institute of Technology) and the Massachusetts Institute of Technology, where he received a degree in electrical engineering.

He was assistant professor in electrical engineering at the Unversity of Southern California from 1909 to 1912. In that year he joined the Edison company as an electrical draftsman in the engineering department. He was made electrical designer six years later, and electrical division head in 1922. He became assistant electrical designing engineer in 1928 and engineer in the hydro division in 1932. He had been superintendent of hydro generation since 1940.

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▶ R. H. CHADWICK, assistant to the manager in charge of engineering at the Fort Wayne Works of the General Electric Co., died on May 29, after an illness of several weeks. He was 51 years old. Mr. Chadwick was born in Gardiner, Maine, in 1892, and joined the General Electric organization in 1912, following graduation from Brown University. He was a member of the American Institute of Electrical Engineers.

▶ HERBERT R. OWEN, vice-president and manager of the New York office of Landers, Frary & Clark, died on May 22 at his home in New Rochelle, N. Y., after a short illness. He was 53 years of age. Before his association with Landers, Frary & Clark, Mr. Owen was sales manager of the New York division of the Cleveland Metal Products Co. After joining Landers, Frary & Clark he became sales manager of the department store division in June, 1923. He was elected a vice-president in 1926

A LIGHT-REFLECTING FLOOR IS THE ANSWER.

Light-colored floors made with Atlas *White* portland cement, instead of gray portland cement or still darker materials, reflect more light on vertical work surfaces as well as on under surfaces. They improve seeing . . . speed production . . . reduce accidents. Installations for Boeing, Consolidated, Douglas, North American, and others prove this.

Light measurements made by General Electric in the Consolidated Aircraft Plant at Fort Worth show that a *white*-cement floor, compared with a gray-cement floor in the same plant—

- ▶ increases illumination on vertical surfaces by 20%;
- ▶ increases by 61% the illumination on underside surfaces;
- ▶ reduces shadows and dark areas;
- ▶ reduces contrasts . . makes seeing easier, more comfortable, and more efficient.

Floors made with Atlas *White* portland cement help provide all the work-speeding advantages of better illumination. For the complete story, write today for your copy of the 24-page booklet, "Light from Floors." Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York City.

HOW ABOUT MAINTENANCE?

Experience shows white-cement floors are easy to clean, easy to keep clean, and retain their reflection advantage. Maintenance is simple—frequent sweeping, occasional damp mopping, periodic scrubbing.

EW-F-19

ATLAS WHITE CEMENT
For Light-Reflecting Floors

Model 21

Here is a compact accurate hand tachometer that makes it easy to measure speeds. RPM and surface speeds are instantly indicated on the large easy-to-read dial.

Single and triple range models complete with accessories and carrying case. Single ranges up to 10,000 rpm. Triple ranges up to 12,000 rpm. Write for descriptive bulletin today.

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Advertising men agree . . . the list is more than half the story. McGraw-Hill Mailing Lists, used by leading manufacturers and industrial service organizations, direct your advertising and sales promotional efforts to key purchasing power.

In view of present day difficulties in maintaining your own mailing lists, this efficient personalized service is particularly important in securing the comprehensive market coverage you need and want. Investigate today.

McGraw-Hill Publishing Co., Inc.
DIRECT MAIL DIVISION
330 West 42nd St., New York, N. Y.

and assumed charge of the New York office in 1936. An expert in department store merchandising, Mr. Owen was one of the best known figures in the housewares field. He was president and a director of the New York Housewares Manufacturers Association, Inc.; chairman of the manufacturers group of the Electrical and Gas Association of New York, Inc., as well as a member of the board of governors of the organization. Mr. Owen was also a member of the Sales Executive Club of New York and the Housewares Club of New York.

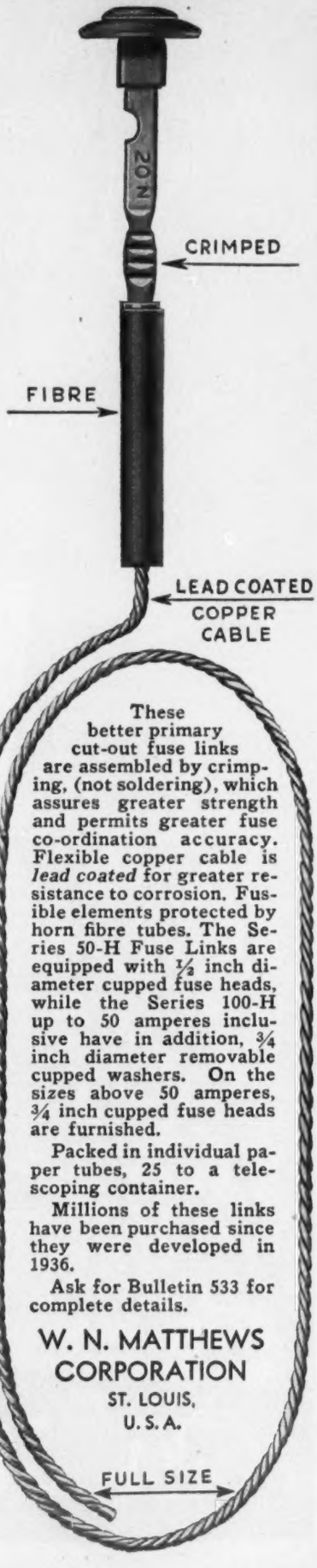
► ROBERT E. BROWN, Pacific Coast division manager of Electro Metallurgical Sales Corp., New York, N. Y., died on May 26 at Belmont, Calif., at the age of 46. He had been ill for several months. Mr. Brown first began his association with units of Union Carbide & Carbon Corp., in 1920, when he took a position with Electro Metallurgical Co. at Niagara Falls, N. Y. After a short time he was transferred to the Pacific Coast division of Electro Metallurgical Sales Corp. and became division manager in 1940. At the time of his death Mr. Brown was also district sales manager for the electrode division of National Carbon Co., Inc., another unit of Union Carbide & Carbon Corp. He was a graduate of Lehigh University and a member of the American Society for Metals.

► E. C. SWARTHOUT, owner and manager of the Neshonoc Light & Power Co., West Salem, Wis., since 1897, died at his home at Neshonoc on May 10 at the age of 87.

► J. HALL GRIGG, assistant superintendent of underground operations, Georgia Power Co., Atlanta, died on April 29, at his home in Decatur, of a heart attack. He was 46 years of age. Mr. Grigg was born in Murfreesboro, Tenn. He had been employed by the company for more than thirteen years and had been assistant superintendent of the underground section for ten years.

► JOHN S. HABER, vice-president of the recently organized Philco International Corp., died recently in Havana, Cuba, after an operation for acute appendicitis. He was 45 years old. He had been in Mexico on business and had shown no previous signs of illness when he stopped in Havana on his way home. A graduate of New York University, Mr. Haber was with the American Steel Export Co. for 21 years, rising to vice-president. He resigned last March to take the vice-presidency of the Philco International Corp., a new company formed by the Philco Corp. to handle sales of its products in all foreign countries.

50-H AND 100-H MATTHEWS FUSE LINKS



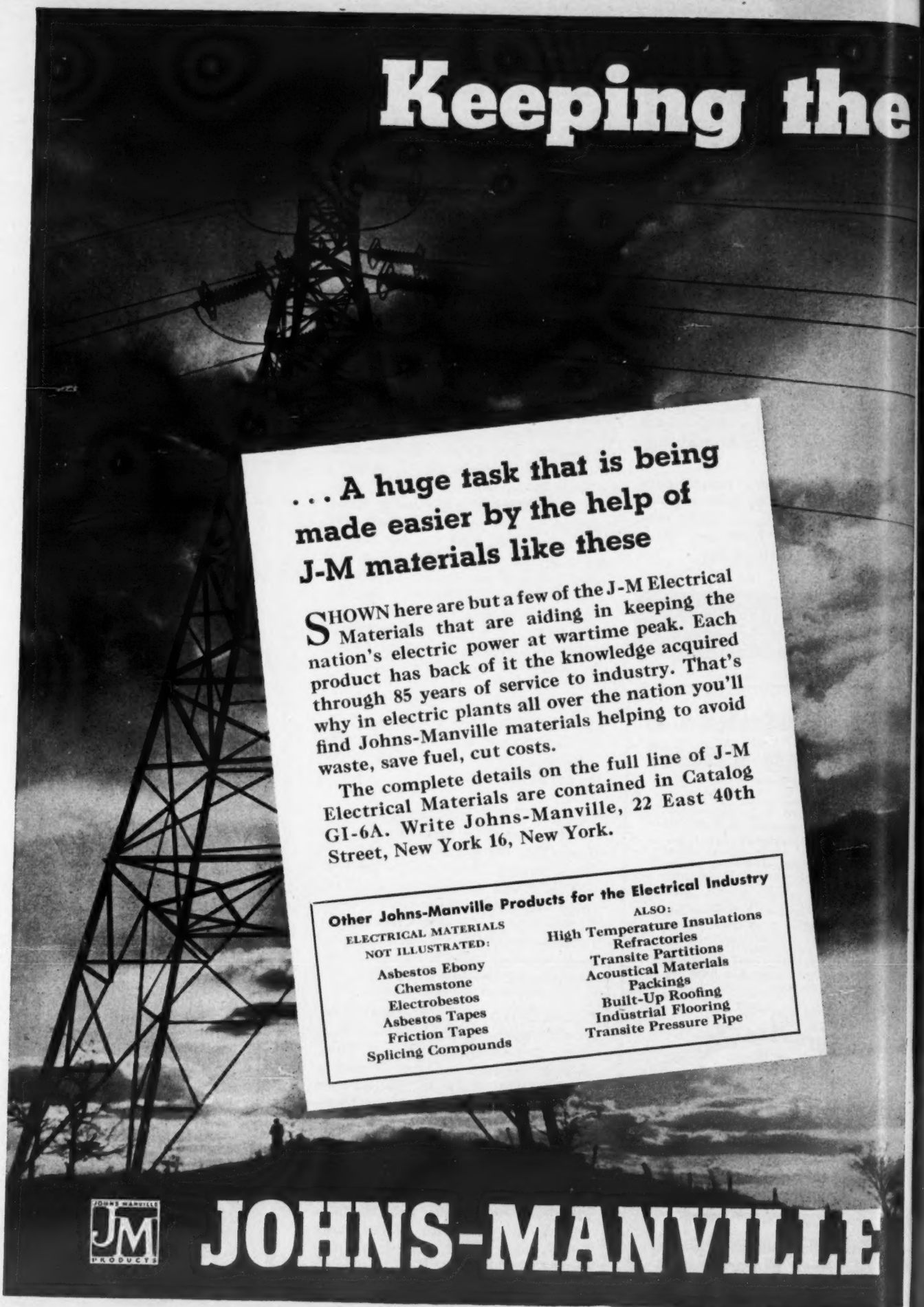
These better primary cut-out fuse links are assembled by crimping, (not soldering), which assures greater strength and permits greater fuse co-ordination accuracy. Flexible copper cable is *lead coated* for greater resistance to corrosion. Fusible elements protected by horn fibre tubes. The Series 50-H Fuse Links are equipped with ½ inch diameter cupped fuse heads, while the Series 100-H up to 50 amperes inclusive have in addition, ¾ inch diameter removable cupped washers. On the sizes above 50 amperes, ¾ inch cupped fuse heads are furnished.

Packed in individual paper tubes, 25 to a telescoping container.

Millions of these links have been purchased since they were developed in 1936.

Ask for Bulletin 533 for complete details.

W. N. MATTHEWS CORPORATION
ST. LOUIS, U. S. A.



. . . A huge task that is being made easier by the help of J-M materials like these

SHOWN here are but a few of the J-M Electrical Materials that are aiding in keeping the nation's electric power at wartime peak. Each product has back of it the knowledge acquired through 85 years of service to industry. That's why in electric plants all over the nation you'll find Johns-Manville materials helping to avoid waste, save fuel, cut costs.

The complete details on the full line of J-M Electrical Materials are contained in Catalog GI-6A. Write Johns-Manville, 22 East 40th Street, New York 16, New York.

Other Johns-Manville Products for the Electrical Industry

ELECTRICAL MATERIALS NOT ILLUSTRATED:

Asbestos Ebony
Chemstone
Electrobestos
Asbestos Tapes
Friction Tapes
Splicing Compounds

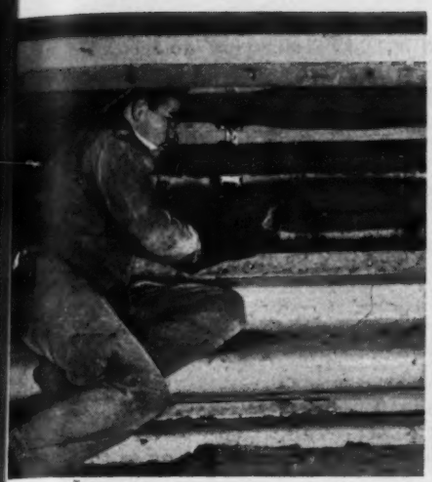
ALSO:

High Temperature Insulations
Refractories
Transite Partitions
Acoustical Materials
Packings
Built-Up Roofing
Industrial Flooring
Transite Pressure Pipe

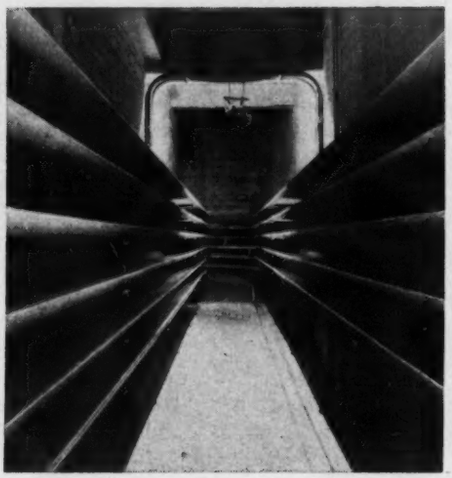
JOHNS MANVILLE JM PRODUCTS

JOHNS-MANVILLE

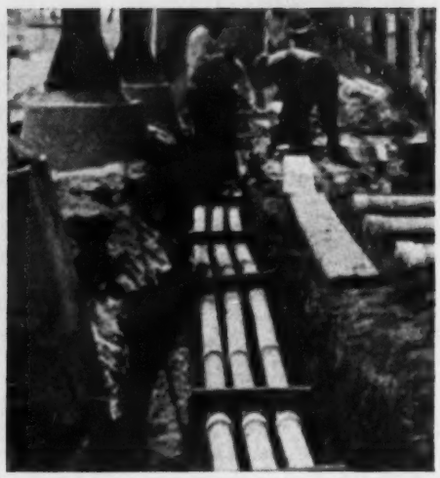
Kilowatts Flowing!



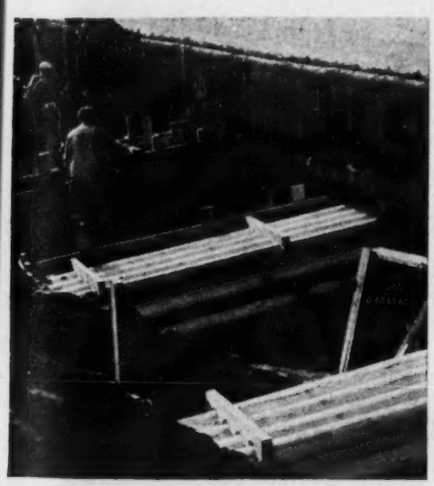
CABLE FIREPROOFING. Niagrite-Asbestoment, a commercially pure asbestos tape with or without reinforcement, which, when wrapped on electrical cables and covered with Asbestoment (an efficient refractory), forms a fireproof protection.



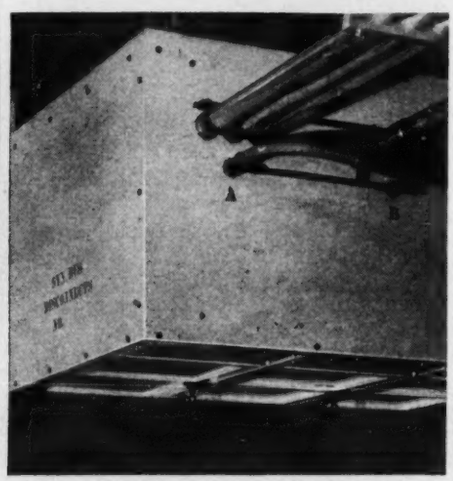
TRANSITE CABLE TRAYS are made of an incombustible, mechanically strong, corrosion-resistant material which eliminates all steel work from the tray construction. Transite Cable Trays save space, cost less to install, need no maintenance.



TRANSITE CONDUIT. Made of asbestos fiber and cement, Transite Conduit is approved for use underground without concrete envelope. Both Transite Conduit and Korduct help provide lower installation cost and reduced maintenance expense.



TRANSITE KORDUCT. Korduct is identical with the Conduit except for its lesser wall thickness. Like Transite Conduit, Korduct is fireproof and highly resistant to internal or external corrosion, electrolysis and action of soil chemicals.



TRANSITE, FLAT & CORRUGATED. Where dialectric strength is not required this leading fire-resistant material composed of asbestos fiber and cement is ideal. It is rot and termite proof. Adapted for use as a barrier wherever an arc may possibly occur.

DUXSEAL. A non-hardening, adhesive, plastic compound that will not slump or flow. Used for sealing the openings between cables and duct walls in manholes, service entrances, riser ducts, etc. Comes in 5-lb. pugs, 1-lb. packages and 70-lb. containers.

ELECTRICAL MATERIALS

MANUFACTURING-MARKETS

Post-War Products Delay Predicted

"Dream" devices coming, but not right away, says Westinghouse

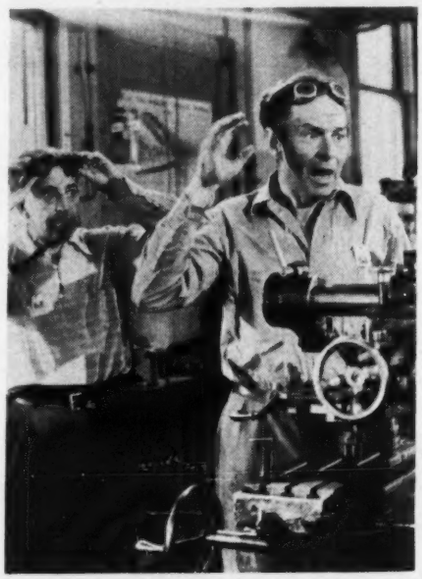
The American public was cautioned not to expect fantastic, radical, war-born dream products to become actual realities in the immediate post-war period, by T. J. Newcomb, sales manager of the Westinghouse appliance division, last week at a meeting in the Waldorf Astoria Hotel in New York, which this year took the place of the company's annual peacetime display of its new line of electric appliances.

Pointing out that immediate post-war appliances will include minor improvements, Mr. Newcomb said that when the war ends, Westinghouse will get into production fast, not only to serve a pent-up demand, but equally important, to maintain high employment. To do this means using tools, machines, materials and "know-how" that are in existence from pre-war days.

As far as patriotic conditions will permit, Mr. Newcomb said, Westinghouse engineering laboratories are experimenting, and perfecting improvements in all of our electric appliances. Refrigerators, for example, must ultimately meet the requirements of the rapidly growing frozen food industry. Electric ranges will also have temperature controls and automatic features far beyond our present conception. The drudgery of washing on "blue Monday" will probably come in for the greatest transformation. Clothes will be washed, rinsed and dried by a simple flip of the switch. Even ironing will be simplified and the two-day laundry problem will be handled in the space of a few short hours.

Mr. Newcomb was one of three Westinghouse executives who addressed the meeting in connection with a preview of the company's new nutrition movie titled "This Too Is Sabotage," a film produced to help the nationwide fight against industrial absenteeism. The other speakers were J. H. Ashbaugh, manager of the Westinghouse electric appliance division, and Mrs. Julia Kiene, director of the Westinghouse Home Economics Institute.

The company's job at the moment, Mr. Ashbaugh said, is to help win the war by supplying vital equipment for the armed forces and by safeguarding health on the home front through nutritional guidance and appliance care and use assistance."



NUTRITION MOVIE—A flash from the new nutrition motion picture, "This Too Is Sabotage," produced by Westinghouse to help the nationwide fight against industrial absenteeism

Westinghouse efforts to safeguard health in war time through nutritional guidance were begun 16 months ago under the direction of Mrs. Kiene, founder of the Health for Victory Club program now used by 1,116 war plants, schools, churches, department stores and other organizations.

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Joshua Hendy Sets Record

Charles E. Moore, president of the Joshua Hendy Iron Works, revealed recently that the employees of his firm celebrated Memorial Day by delivering to the Maritime Commission enough marine engines to power over 50,000 tons of vessels now being completed by Pacific Coast shipyards. This record-breaking delivery consisted of four 2,500 hp. engines that power Liberty ships, one 2,750 hp. engine for a corvette, and one 4,000 hp. turbine and reduction gear assembly for a C-1 cargo vessel. In addition, one Navy torpedo mount was delivered. The total value of these deliveries was approximately $750,000. Weight of the reciprocating engines alone was more than 1¼ million pounds, and required thirty freight cars to move.

•

Court Upholds Dropping Dividends in Merger

The Third United States Circuit Court of Appeals ruled recently that the corporation law of Delaware permits the elimination of accumulated dividends on the preferred stock of a corporation through merger with a wholly owned subsidiary. Ruling was made in a unanimous decision approving the merger of York Ice Machinery Corp. with its subsidiary, York Corp.

Under the proposed merger, $4,600,000 in accumulated dividends of the machinery company's 7 percent stock would be eliminated and each share of the preferred stock with its accumulated dividends would be surrendered for fifteen shares of York Corp. common stock.

The plan was approved by holders of 75.9 percent of the machinery company's preferred stock and of 75.1 percent of its common stock, but R. Thomas Moore, holding 50 shares of preferred, bought suit, maintaining that preferred stockholders would be deprived of accumulated dividends of $44.25 per share.

•

Washer Makers Discuss Laundry Situation

Growing seriousness of the household cleanliness problem in the United States was stressed by the American Washer and Ironer Manufacturers Association at a meeting held recently in Chicago. The association plans a poll of its members in order to learn to what extent they could again begin making home laundering equipment without interference with the war effort.

The industry's resumption of production of civilian lines naturally would depend upon Washington's decision, but the Administration is directly concerned, the association says, because

the cleanliness problem is worst in congested war industry areas.

Manufacturers pointed out that commercial laundries have become swamped with work, partly due to women's inability to obtain washers at the same time that they are contending with a shortage of laundry machinery and labor supply difficulties.

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A-C Contract Increased

Defense Plant Corporation has authorized an increase of $2,000,000 in its contract with Allis-Chalmers Manufacturing Co., Milwaukee, Wis. The funds will be used to provide additional plant facilities in Wisconsin and will result in a total commitment of $25,000,000.

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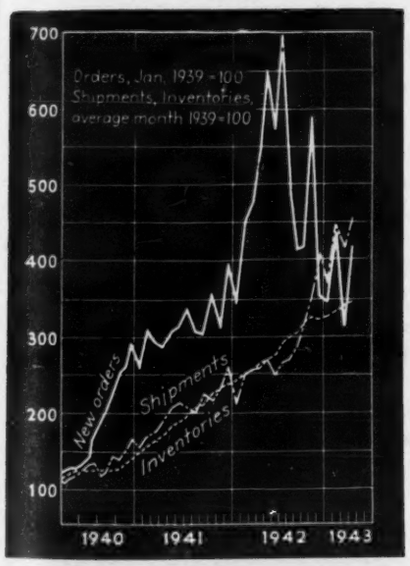
Electric Machinery Indices Advance

New orders received by manufacturers of electrical machinery during the month of April advanced sharply, according to the index compiled by the Bureau of Foreign and Domestic Commerce. After dropping in March to 319 (revised) from 437 in February,



ELECTRICAL MACHINERY INDICES of Bureau of Foreign and Domestic Commerce

the index moved upward to 418, comparing with 548 in April, 1942.

The index of the value of electrical machinery shipments also advanced in April to 454 from 415 in March, comparing with 259 in April, 1942.

Electrical machinery inventories index rose slightly to 347.0 in April, compared with 341.9 (revised) in March. In April, 1942, it stood at 264.2.

Field Reports on Business

Reports on trade received from various sections of the country indicate that most of the heavy industries continue to show declines. In the electrical field, small motors, cable and signalling apparatus are active. Retail business is showing substantial gains, apparel store sales being a feature.

NEW ENGLAND

Supplies for naval vessels are moving to New England yards in good-sized volumes where installations of electrical machinery and apparatus are going on at a good pace. Electric cable, small switches, and communication materials are being shipped in large lots. The equipping of ship machine shops, engine room lockers, and stores has resulted in numerous orders for small bench tools in lots which involve as high as $50,000 each.

Orders received by manufacturers of this district include electric water stills, vacuum tubes and sockets, conduit and electric cable, resistors, and signalling apparatus. Sturtevant fans have entered the dehydrated food industry and are now serving a Salinas, Cal., food drying plant where 12 fan units were recently installed. A machine and fabrication shop costing in the neighborhood of $100,000 will be built by T. Leroy Fox Co., Boston, for the Mystic Steamship Co., and should stimulate sales of industrial electrical equipment. A $50,000 temporary building will be built in an Army area in eastern Massachusetts by John Bowen Co., Boston, and another of similar type in Connecticut by Lane Construction Co., Meriden, Conn.

The demand for quartermasters' stores is moderating and has affected some slowing down in the textile and leather districts. Department store sales are up; small electric shops have been pretty well denuded of new stocks and reconditioned electrical apparatus, particularly in the domestic appliance field, is fast being absorbed by the public. Garages and filling-station repair shops are beginning to pass up certain types of repair work for lack of electrical automotive supplies.

PACIFIC COAST

Predicted expiration of the new work of the War Housing Authority on September 1 will remove a considerable source of building volume, though it is disproportionately small electrically. However, a considerable portion of $400,000,000 recently recommended by the President was earmarked for the Pacific Coast, especially in the Bay region. Value of building permit total for the western states amounted to $19,090,000 for May, 1943, an increase of 16 percent over May, 1942, accounted for by 30 percent increase in California, which decreases in the other six states could not overtake.

Congress is being asked to increase its Central Valley project appropriation to $30,900,000, divided about equally between Shasta Dam and the smaller dams and canals in central California. The California legislature has allotted $43,000,000 for post-war public building.

An estimated 215,000 women are now being employed in California factories, as compared with 65,000 at this time last year.

Varied orders include $150,000 auxiliary motors for Kaiser's steel plant in southeastern California; three 300 kva. and three 500 kva. load center units for a yard making concrete ships; large reserve stock orders for armatures and miscellaneous spare parts for generators for both Army and Navy; 800 fractional hp. motors, costing $20,000, for pressure pump outfits; a 45-ton G.E. locomotive, costing $30,000, for a North Bay shipyard; and a navy order received from a firm of engineering contractors, covering generators, rheostats, and parts, totaling $360,000.

NEW YORK

Corporate profits, after taxes, in the first three months of 1943 totaled $1.8 billion on the basis of present tax rates, an 18 percent increase over a year ago, the Commerce Department reports. Seasonal expansion of farm operations in April brought total United States employment to a new high of 60,900,000, according to the National Industrial Conference Board.

Civil engineering construction volume in continental United States for the week totaled $44,234,000, *Engineering News-Record* reported on June 17. This volume was 37 percent below the preceding week and 72 percent below the volume reported for the corresponding 1942 week. Private construction declined 30 percent from the preceding week and was down 44 percent from a year ago. Public work was 37 and 74 percent lower, respectively, than in the preceding week and the 1942 week. The week's construction brought 1943 volume to $1,712,510,000 for the 24-week period, an average of $71,355,000 per week.

Retail trade in the metropolitan area continued active last week. Department-store volume was estimated as running approximately 30 percent above the comparative week last year.

CHICAGO

Manufacturers of heavy electrical apparatus report volume of equipment orders currently stable at low levels. Volume for the first half of June is about parallel with that for the first half of May. Most sources report a slight drop in orders originating with industrial and government sources, continuing a gradual decline started earlier in the year when the war industry expansion started to drop off.

Utility business continues slow. The trend among manufacturers is toward a larger percentage of orders in war subcontracts with orders for regular line of equipment falling off. One switchgear company reports a "moderate" amount of business, but in amount some 40 percent of 1942 levels. Only significant utility order was for less than $1,000 for 2,000 amp. disconnect switches for a Pacific Coast company.

There is some indication that REA co-ops are preparing to launch upon an expansion program under the government's farm aid plan which may be reflected soon in increased orders for electrical distribution equipment.

Electrical contractors in Chicago report a decline in industrial electrical contract work and predict that government electrical construction contracts will be out of the way in four months. Possibility exists that some 15 percent of skilled electricians in the Chicago area will be required by huge war plants for regular electrical maintenance.

LOYAL AMERICANS ON STRIKE!
This NEWSPAPER advertisement was published in Washington, New York and Chicago by McGraw-Hill, to make friends for business.
GATE 3

How can we end strikes?

Management ~~vs~~ plus Labor

Wartime strikes are different from strikes in times of peace.

While most workers probably feel a sense of shame in participating in them, the fact remains that strikes are taking place.

Viewed in the abstract wartime strikes are symptoms of a basic misunderstanding of industry on the part of government.

McGraw-Hill, through newspaper advertisements, is trying to create an understanding of the changes that are necessary in present government policies in order to help keep industry functioning continuously and smoothly. The advertisement reprinted here is the latest of a series which appears every two weeks.

More and more manufacturers are recognizing the need of educating the people in their own communities, as well as their own employees, on the relationship of sound industrial progress to good living. Many companies are distributing booklet reprints of these "Seed Money" messages and are quoting them reglarly in their own bulletins, house organs and newspaper advertisements.

We will gladly supply a newspaper mat of this advertisement—in full page size—to manufacturers who wish to run it, over their own signatures, in their local newspapers.

James H. McGraw, Jr.

President

McGraw-Hill Publishing Company, Inc.

IT is unnatural for people with sons and brothers at the front to strike.

It's easy to hurl dirty words at them when they do halt war work, but maybe we'll get further if we dig down below the accusations and find out what really is the matter.

Generally strikes result from mis-managed human nature. Sometimes Labor Leaders do the mis-managing, sometimes Management itself is to blame.

► But, in wartime, both Management and Labor Leaders are having the grim experience of watching Government try its hand at managing human nature . . . So far, Government isn't doing so good.

There are many causes of strikes, but we believe the way to stop strikes that are aimed at breaking through wage ceilings is to encourage every man to feel that he is "in business for himself."

The best way to make a man feel that way is to see that he gets an automatic reward for every improvement in his work.

Today, fair and workable plans for tying wages to performance instead of artificial ceilings have been developed. They are being used successfully in many industries.

Such plans should be pushed more vigorously by Government and Labor, as well as Management.

Government is having trouble with human nature on other fronts, too.

Most of this trouble traces back to the fact that Government wants more and more production on one hand, while on the other it discourages the individual enterprise that creates production.

Much of the public resistance to sound and necessary Government acts stems from fear that regimentation and bureaucratic control of our lives is the real goal of Government.

FREE MATS: If you would like to publish this message over your own company name, or distribute it in handy booklet form, write or wire: Research Dept., McGraw-Hill Publishing Co., Inc., 330 West 42nd St., New York (18), N.Y.

How can we end strikes? (cont'd)

The real objective of Government should be to release the immense powers of *individual* effort.

After all, Government's need is simple. It wants MORE WORK DONE IN LESS TIME.

Getting more work done in less time is Industry's dish.

Doesn't it make sense, therefore, for Government to devote every effort to making it easy for Industry to do its job?

If government people want to know how industry has gotten more work done in less time, the answer is easy. Here it is:

1. Constantly improve the equipment available for workers.
2. Use the lowered costs thus produced to
   (a) lower prices to consumers.
   (b) raise wages in proportion to increased efficiency.
   (c) provide incentives for invention, investment and individual enterprise.
   (d) lay aside "Seed Money" that can be used to start over again at item 1.

Constantly Improved Equipment

► Few people ever think of "constantly improved equipment" as a helpful answer to war production, manpower shortages, raw materials shortages, food shortages and post-war jobs.

Yet constant improvement in machines and methods is our only chance for doing more work in less time.

Lower Costs Produce Lower Prices

In these days of price ceilings, we think so much of *higher* prices that we forget how easy it will be to *lower* prices when we can get better machines.

Wages in Ratio to Efficiency

With all the talk of wage freezing, we also forget that the true American system is to raise wages *without increasing prices*, through better machines and methods. Strikes for higher wages disappear when incentive wages are properly used.

Incentives for Invention, Investment and Development

► Of all the things that helped make America great, this is the one that has taken the most kicking around.

Excessive taxes on business profits, salary freezing and hundreds of other political limitations discourage the old "take a chance" spirit that built up our country.

Lower Costs Provide "Seed Money"

► Another thing you hear a lot of talk about in Washington is "Post-War Planning."

In Washington, that means public works and government spending.

In Industry, it means developing and buying new machines to produce new products to sell at lower prices to attract enough new buyers to make 20,000,000 new jobs.

The Washington plan means more taxes.

The Industrial way will pay for itself.

But Industry will need billions of dollars to convert its machines and factories back to peace work. That will cost as much as war conversion, or more.

That's why Industry needs to save its "Seed Money" now.

The only way industry can get more "Seed Money" is through a complete change of government attitudes toward industry. We hope government people will soon see that when tax laws decrease the saving of "Seed Money" (money earmarked for plowing back into a business) they strike at industry's only means of developing this country after the war.

What You Can Do About It

If you agree with this advertisement, then write to your congressman and tell him you believe in the Incentive System that has built up our country—that means Incentive for labor, as well as for invention, investment and management. Ask him to review each proposed law and regulation with this fact in mind:

"Industrial Progress is the Source of all Good Living."

THE McGRAW-HILL NETWORK OF INDUSTRIAL COMMUNICATION

22 publications, which gather "war-news" from the "war-production-front" through a staff of 153 editors and 725 engineer-correspondents . . . More than 1,500,000 executives, designers, production men and distributors use the editorial and advertising pages of these magazines to exchange ideas on war-production problems.

McGRAW-HILL BOOKS

Publishers of technical, engineering and business books for colleges, schools, and for business and industrial use.

This advertisement is available in handy booklet form. (Less than 100 copies free. Larger quantities, $1.50 per 100; $10.00 per 1000.)

McGRAW-HILL

PUBLISHING COMPANY, INC. . . . BOOK COMPANY, INC.

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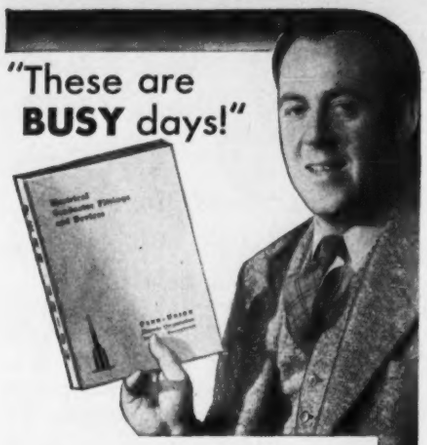

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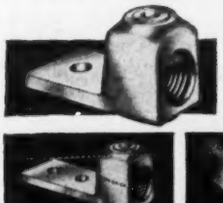

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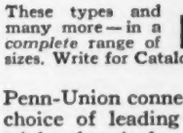
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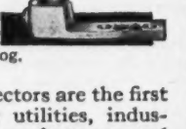
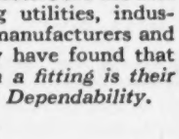

Round, center



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Sales Opportunities

NEBRASKA—Nebraska Power Co., Omaha, plans extensions in primary lines. Permission has been granted and work is scheduled to begin soon.

LOUISIANA — Mathieson Alkali Works, Inc., 60 East 42nd St., New York, N. Y., will carry out expansion in plant for production for government, including several new one and multi-story processing and production units, and auxiliary structures, with mechanical and electrical equipment. Also will increase power facilities at plant. Entire project will cost about $11,000,000, with financing by Defense Plant Corp.

OHIO — War Department, Washington, D. C., will begin work soon on new power plant, about 120x122 ft., reported to cost over $500,000, with equipment. Bids have been asked for building erection and award will be made soon; equipment purchases will be made separately. Schenck & Williams, Third National Bank Bldg., Dayton, are architects. Also will build five-story static test laboratory, about 247x269 ft., at same place, with installation to include two monorail cranes, pumping equipment, electric clock system and complete electrical facilities. Cost reported over $750,000. Hazelet & Erdal, 53 West Jackson Blvd., Chicago, Ill., are consulting engineers. A new one-story foundry will be built on neighboring site, with mechanical and electrical facilities for large output. Erection is scheduled to begin at early date. Cost estimated about $200,000. Roberts & Schaefer Co., 307 North Michigan Ave., Chicago, Ill., is consulting engineer. Plans are being completed for new one and multi-story airport building at same location, for which bids will be asked at early date. Cost estimated close to $1,000,000, with electrical and mechanical equipment. Allen & Kelley, Architects' & Builders' Bldg., Indianapolis, Ind., are architects. Entire project will be supervised by U. S. District Engineer Office, Wright Field, Dayton.

NEBRASKA — Consumers Public Power District, Columbus, plans extensions in primary and secondary lines, with substation and service facilities. Permission has been granted and work will be placed under way at early date.

OHIO—Republic Steel Corp., Republic Bldg., Cleveland, plans expansion in plant for production for government, including new buildings and installation of mechanical and electrical equipment. Cost about $875,000, with financing by Defense Plant Corp. Work will be carried out soon.

WEST VIRGINIA—Civil Aeronautics Administration, Washington, D. C., has authorized expansion in airport, including hangar, shop and other structures, with electrical and mechanical equipment; also lighting installation and other electrical facilities. Fund of $300,000 has been authorized for project.

IDAHO—Clearwater Valley Light & Power Association, Lewiston, has approved plans for extensions in primary and secondary lines, total about 57 miles, with line transformers, service facilities, etc. Work is scheduled to begin at early date.

MICHIGAN—Ford Motor Co., Dearborn, has contracted with government for expansion in a plant, including new buildings and installation of mechanical and electrical equipment. Cost estimated about $3,300,000, with financing by Defense Plant Corp. Work is scheduled to proceed at early date.

SOUTH DAKOTA — Municipal Power & Light Department, Pierre, has preliminary plans under way for expansion in municipal power plant as a post-war project, to include installation of new engine-generator unit and auxiliary equipment. Fund is being arranged, to be increased periodically, providing for cost when time matures for project.

ARKANSAS—Civil Aeronautics Administration, Washington, D. C., regional office, City Hall, Kansas City, Mo., is considering new airport, comprising hangars shops and other buildings, with mechanical and electrical equipment; also electrical distribution lines and lighting facilities, with control station, etc. Entire project is estimated to cost about $600,000.

OHIO—Owens-Corning Fiberglas Corp., Nicholas Bldg., Toledo, will carry out expansion in plants in Ohio, Pennsylvania and Rhode Island for production for government, including new buildings, with mechanical and electrical equipment. Cost about $530,000, with financing by Defense Plant Corp. Work will be carried out soon.

FLORIDA—Navy Department, Washington, D. C., has authorized extensions in electrical distribution system at a naval training center. Additions also will be made in steam distribution system at same place, entire project to cost about $230,000. Bureau of Yards and Docks, Navy Department, Washington, will be in charge.

NEBRASKA—McCook Public Power District, McCook, plans extensions in primary and secondary lines in three counties, including line transformers and service facilities. Application has been made for permission.

CALIFORNIA — Navy Department, Washington, D. C., plans installation of an electric generating station and distribution system at a naval base, estimated to cost about $92,000. This is part of a general expansion program at two other bases, including shops, warehouses and other structures, with mechanical and electrical equipment; addition to a boiler house, with new boilers and accessories; extensions in electrical distribution lines, and other facilities. Entire project will cost $1,463,500. Bureau of Yards and Docks, Navy Department, Washington, will be in charge. Work will be placed under way at early date.

OHIO—Diamond Alkali Co., Oliver Bldg., Pittsburgh, Pa., will carry out expansion in a plant operated by a subsidiary interest, including new buildings and installation of mechanical and electrical equipment. Cost estimated about $2,700,000, with financing by Defense Plant Corp. Proposed to begin work soon.

NEW YORK — National Lead Co., 111 Broadway, New York, will begin work at once on proposed new plant for production for government, for which general contract has been let to Turner Construction Co., 420 Lexington Ave., New York. It will comprise a main one-story building and several auxiliary structures, reported to cost $1,500,000. Financing will be provided by Defense Plant Corp., which will retain title to property. Mechanical and electrical equipment will be installed for large output. Greenawalt Engineering Co., 135 East 42nd St., New York, is consulting engineer.

EA Allots $1,957,000 to 23 Systems

The Rural Electrification Administration recently announced allotments aling $1,957,000 to 23 systems in 16 tes and Alaska, to finance facilities eady completed in accordance with PB regulations, to acquire existing operties which will facilitate electrition of additional farms in the postr period, and for immediate extenn of service to more than 1,000 farms alifying under present WPB regulans permitting connections to farms oducing livestock, dairy and poultry oducts.

In announcing the allotments, which ing the total to $466,192,465, of which ,471,550 represents operations during e current fiscal year, Administrator arry Slattery said that no new conuction will be undertaken except in cordance with authorization or regution of the War Production Board.

Among the larger allotments are the llowing:

COLORADO—Intermountain Rural Elecification Association, Littleton, $320,000.
MINNESOTA—McLeod Cooperative Power sociation, Glencoe, $50,000.
MISSOURI—Northwest Missouri Electric operative, Savannah, $460,000.
OKLAHOMA—Indian Electric Cooperative, c., Cleveland, $552,000.
TEXAS—Panola-Harrison Electric Coerative, Inc., Elysian Fields, $145,000. sper-Newton Electric Cooperative, Inc., irbyville, $185,000.

•

xpansion Announced by Columbia Electric

The electrical firm of which Eric A. ohnston, president of the U. S. Chamer of Commerce, is president—the olumbia Electric & Manufacturing o., Spokane, Wash.—has expanded take in an additional building.

"The great increase in the demand r our product from the navy has ecessitated the acquisition of this new uilding, which will more than quadple our present factory facilities," id Walter A. Toly, manager of the anufacturing division of the comany. . . . "We now employ 137 men our factory, but will immediately inrease this to at least 250."

•

lectric Steel Sets Record

Production of electric furnace steel et a new monthly record of 398,057 et tons in May, an increase of 15,525 ns over the previous record, made in pril, and 64,857 tons more than was roduced in May, 1942, the American on and Steel Institute has announced.

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Have you a Canadian Manufacturing or Distribution problem which is giving you some concern? If so, communicate with us as we are interested in purchasing or operating your plant, or would consider marketing your products. Prefer items used by large industrial plants, municipalities and utilities. All replies will be treated confidentially.

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LETTERS TO THE EDITOR

Ground Detector Patent Released

To the Editor of ELECTRICAL WORLD:

I am wondering if the editor would do me a favor. I have had a patent (No. 1,589,699) on ground detector that has been used by most all utilities. I would like to notify these users that the patent expires on June 22, 1943, so they now will be free to use it. It's theirs thenceforth.

LLOYD F. HUNT,
Los Angeles.

•

Watts for Ballasts

To the Editor of ELECTRICAL WORLD:

I was going through the May 29, 1943, issue of ELECTRICAL WORLD and proceeding in an orderly fashion, until I arrived at page 92 and read the description of the change in the lighting system for the offset press of the Providence Lithograph Company. I turned back to the front cover to be sure of the date, because when I read that description I thought I was back in the days of 1939, when the proponents of fluorescent lighting generally failed to indicate to a customer that ballasts also used wattage.

Of course, the story on your page 92 is still good, even if it is discovered that two 40-watt fluorescent lamps and ballasts amount to approximately 100 watts, giving a total for the installation of approximately 1,000 watts instead of the 800 watts as stated. Yours for wattless ballasts,

HOWARD M. SHARP,
Buffalo Niagara & Eastern Power Corp., Buffalo, N. Y.

•

Nash-Kelvinator Plans Helicopter Production

Nash-Kelvinator Corp. has completed arrangements with the U. S. Army Air Forces for quantity production of Sikorsky helicopters, G. W. Mason, president of the company, has announced.

The helicopters, designed and built by the Sikorsky Aircraft division of United Aircraft Corp., will be constructed by Nash-Kelvinator under license from United Aircraft Corp. This makes the third product of United Aircraft to be built under license by Nash-Kelvinator.

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P-562, Electrical World
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POSITIONS WANTED

ELECTRICAL ENGINEER: Age 45 years, 24 years professional engineering experience, 20 years in the public utility field, 18 years in responsible charge of engineering work; at present employed as Assistant-Chief Engineer of Public Utility. Desires an engineering or executive position with utility or electrical manufacturer. PW-553, Electrical World, 330 W. 42nd St., New York, N. Y.

MANAGER—Wide experience all phases of local and territorial operation and management electric, gas, water, ice, heating, etc. Steam, hydro, and diesel. Public relations specialist. Past ten years with present connection. Satisfactory references. Would consider change where ability needed. Past draft age. PW-554, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

ELECTRICAL ENGINEER — Draft exempt. Extensive experience, maintenance, testing, and installation of watt hour meters and also investigation of consumer complaints. Have also some teaching experience. Would like position as meter foreman or assistant foreman. Location preferred New England or New York. PW-563, Electrical World, 330 W. 42nd St., New York, N. Y.

POSITION DESIRED—Graduate electrical engineer, married, age 38, draft exempt, twelve years present connection. Broad experience, electric, water, gas and ice-rates, power sales, operation and public relations. Excellent reference. Release obtainable. Desires position as Engineer, General Superintendent, or Manager of public utility. PW-565, Electrical World, 520 N. Michigan Ave., Chicago, Ill.

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WANTED

SALARY $10,000 to $15,000 per year. Permanent position. Applicant to qualify must have selling, organizing and executive ability, plus engineering training. Age 40 to 47. Replies to be held in strict confidence. Our organization knows of this advertisement. P-557, Electrical World, 520 No. Michigan Ave., Chicago, Ill.

Sales Manager

WANTED

SALARY $10,000 to $15,000 per year. Position permanent. Necessary experience to qualify requires sales and engineering training plus executive experience. Age 40 to 49. All replies will be held strictly confidential. SW-558, Electrical World, 520 No. Michigan Ave., Chicago, Ill.

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100 HP, 600 RPM, 440 volt, G.E., sq. cg.
100 HP, 514 RPM, 440 volt, G.E., sq. cg.
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75 HP, 900 RPM, 4000 volt, Elec. Mach. syn.
75 HP, 900 RPM, 220 volt, Fairbanks Morse, slip ring.
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50 HP, 900 RPM, 440 volt, GE, slip ring.
50 HP, 900 RPM, 440 volt, GE, sg. cg.

MOTORS—D.C. 230 VOLTS

250 HP, 760 RPM, Electro Dynamic.
150 HP, 750 RPM, Electro Dynamic.
125 HP, 600 RPM, Westinghouse, SK.
100 HP, G.E., 575 RPM.
100 HP, 625 RPM, G.E.
65 HP, 1000 RPM, G.E., type RC.
50 HP, 750 RPM, Westinghouse, type SK.
50 HP, 700 RPM, Crocker Wheeler.
40 HP, 775 RPM, Westinghouse.
40 HP, 300 RPM, G.E.
30 HP, 750 RPM, G.E., type RC.

TRANSFORMERS

2—400 KVA, G.E., 4156-240/480 v., Scott taps.
3—300 KVA, Pittsburgh, 7800/440 volts.
3—250 KVA, Westinghouse, 5500/440 volts.
1—200 KVA, Pittsburgh, 7800-110/220 volts.
3—200 KVA, General Electric, 2200-220/440 volts.
3—150 KVA, G.E., 33,000 2300/4000 Y.
3—100 KVA, Westinghouse, 11,430/250 volts.
1—100 KVA, Pittsburgh, 1375/2750-110/220 volts.
3—100 KVA, Westinghouse, 13200 250 volts.
3—100 KVA, General Electric, 2200-220/110 volts.
3—75 KVA, G.E., 13,500-7500/440 volts.
1—75 KVA, G.E., 3 phase, 4156Y-120/208Y.
1—75 KVA, Pittsburgh, 7600-110/220 volts.
3—50 KVA, Wagner, 4150-220 volts.
2—50 KVA, Pbgh. 7500/15,000 volts-110/220 volts.
4—37½ KVA, 2200-220/110 v.
7—25 KVA, Westg., air cooled, 440/220-110 v.
1—25 KVA, G.E., 220/110-220/110 volts.
2—15 KVA, G.E., 2300-115/230 volts.

MOTORS—VARIABLE SPEED 230 VOLTS

2—100 HP, 475/1375 RPM, Electro Dynamic.
1—90 HP, 470/940 RPM, General Electric.
1—75 HP, 525/1575 RPM, Electro Dynamic.
1—60 HP, 600/1200 RPM, General Electric.
1—35 HP, 500/1500 RPM, Westinghouse.
1—35 HP, 350/1050 RPM, Electro Dynamic.
1—30 HP, 225/900 RPM, Crocker Wheeler.
2—25 HP, 300/900 RPM, Electro Dynamic.
1—20 HP, 750/1500 RPM, General Electric.
1—15 HP, 300/1200 RPM, G.E.
1—13/18 HP, 350/1200 RPM, Electro Dynamic.
1—5 HP, 600/1200 RPM, General Electric.
1—5 HP, 450/1800 RPM, Crocker Wheeler.
1—5 HP, 400/1600 RPM, Diehl.
1—5 HP, 225/900 RPM, Electro Dynamic.

INSTRUMENTS

25—Westinghouse type U recording ammeters with split core CT.
25—Westinghouse type U recording voltmeters.

TURBO GENERATORS

600 KW Terry dual bleeder condensing Turbine only.
1—500 KW, G.E., 3 ph., 60 cy., 480 volt, bleeder.
1—375 KVA, Westinghouse, non-condensing.
1—300 KW, G.E., 3 ph., 60 cy., 220 volt, cond.
1—200 KW, G. E., 3 ph., 60 cy., 220 volt, cond.

OIL CIRCUIT BREAKERS

1—3000 amp., 15,000 v., 3 pole, G.E., type FK-130.
1—3000 amp., 600 v., 4 pole, G.E., type FK-24.
1—1600 amp., 7500 v., 4 pole, Westg., B-2.
1—1200 amp., 15000 v., 4 pole, Westg., B-2.
Also complete stock of small sizes.

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Rotary Converters—3 Ph. 60 Cy.

K.W.	Make	R.P.M.	D.C. Volts	A.C. Volts
1—1500	Whse.	720	650	11500
1—1250	G.E.	720	250	2300
1—1000	Whse.	900	600	2300
2— 750	Whse.	1200	600	2300/4000
1— 300	G.E.	1200	600	13200
Rotary Converters—3 Ph. 25 Cy.				
2—1500	G.E.	500	225/275	6600
1— 500	G.E.	750	225/275	6600
M.G. Sets—3 Ph. 60 Cy.				
1—1500	G.E.	720	600	6600
1— 500	G.E.	720	600	13200

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6600 - 240/480
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Franklin Falls Dam Franklin, N. H.

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150 KW. 225 RPM. 3/60/2300 V. Ft. Wayne
200 KW. 720 RPM. 3/60/240 V. Gen. Elec. ATB
DC GENERATORS
35 KW. 115 Volt, 720 RPM. Allis Chalmers
75 KW. 250 Volt, 500 RPM. Northern
SLIP RING MOTORS
40 HP. 1800 RPM. 3/60/440. Fair. Morse BB
40 HP. 1200 RPM. 3/60/2200, Gen. Elec. MT
40 HP. 900 RPM. 3/60/220, West'house CW
40 HP. 600 RPM. 3/60/440, Gen. Elec. IM
75 HP. 900 RPM. 3/60/220, Gen. Elec. MT
150 HP. 900 RPM. 3/60/440, Gen. Elec. Vert.
AIR COMPRESSOR
14 & 9 x 12 Ingersoll-Rand Imperial type 10 2 stage complete 100 HP. syn. motor

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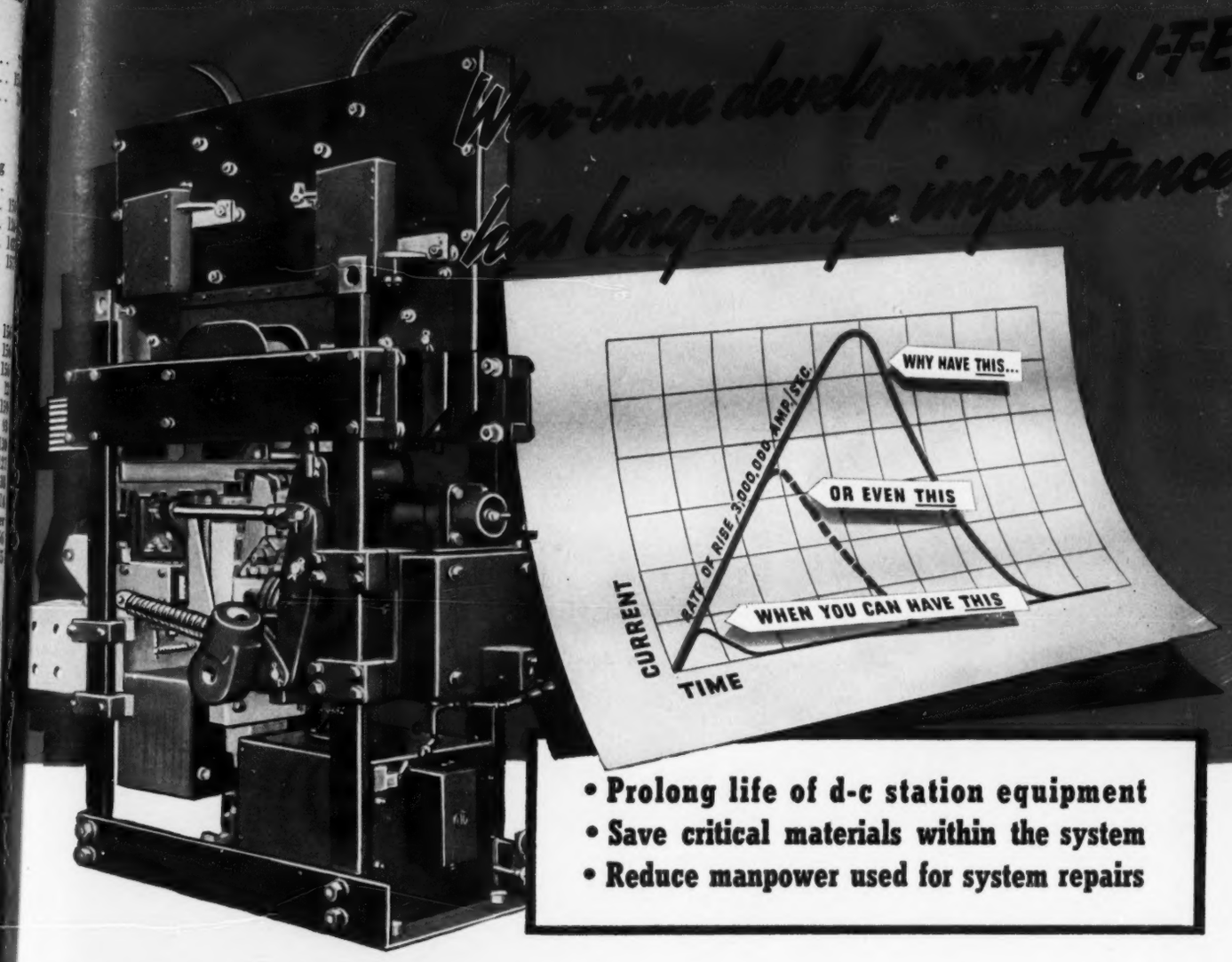
ULTRA-HIGH-SPEED D-C CIRCUIT BREAKERS

War-time development by I-T-E has long-range importance



- **Prolong life of d-c station equipment**
- **Save critical materials within the system**
- **Reduce manpower used for system repairs**

IN THE FIRST DAYS OF THE WAR, need arose for controlling the extremely high fault currents which threatened industrial d-c systems, particularly where generators, converters or rectifiers were connected in parallel. Currents rising at rates of several million amperes per second were capable of causing—and did cause—serious outages with losses in production, waste of station materials and disruption of manpower schedules.

Prior to the war, I-T-E had been working with ultra-high-speed circuit breakers for d-c application. Circuit breakers had been developed and installed which were successful in limiting fault currents to very low values. Fast opening--faster than any heavy-duty circuit breakers had ever achieved--was the answer to the problem. It was the answer when I-T-E adapted design to specific war-time needs. *It is the answer from here on!*

In the future, as now, ultra-high-speed circuit breakers will prolong life of d-c station equipment by removing the hazard of extremely heavy currents. Systems will contain less metal; bus runs will have simpler supporting structures. There will be less maintenance. The circuit breakers themselves will use less material and will have longer life.

• • •

The d-c circuit breaker shown above, the Type FB, has opening characteristics which limit currents within 2/5ths of a cycle (60 cycle basis). The black curve on the chart is drawn from an oscillogram.

I-T-E

AIR SWITCHGEAR

IMMERSED IN AIR • ENCASED IN STEEL

I-T-E

CIRCUIT BREAKER CO., PHILADELPHIA, PA.

The rout of the unstable hydrocarbons

(Important to turbine oil users)

It would be a happy day for oil men, if petroleum's hydrogen and carbon atoms, once having united, would remain inactive. But some of these hydrocarbons are unstable -- they're on the hunt for oxygen. When they get it, they're bad actors. In turbine oil, they cause deposits, sludge, acidity, poor demulsibility, etc. Some of them tend to form asphaltenes, others to form acids. Refining can remove all the asphaltene-forming type, but at the cost of also removing valuable anti-oxidents. Therefore, some of these trouble makers are left in conventional turbine oils. The asphaltene-formers are all removed from Nonpareil, but the anti-oxidents are restored by adding a patented inhibitor. The acid-forming hydrocarbons can't all be removed by the refining process, but the addition of this inhibitor renders them harmless. As a result, we are able to guarantee that Nonpareil's acidity (as expressed by neutralization number) will never exceed 0.15. In service, the number is more likely to be about 0.05, without batch treatment, resting, or replacement, as has been proved in hundreds of turbines. Thus, by beating the two basic types of oxidation troubles, Nonpareil Turbine Oil is able to and does stay clean -- retains its **"new-oil" condition** -- permanently.

Use it, and you'll never again need to clean your turbines. A Standard Lubrication Engineer will gladly furnish details, service records, and further proof. Phone, or write your nearest Standard Oil Company (Indiana) office, or 910 South Michigan Avenue, Chicago, Illinois. In Nebraska, address Standard Oil Company of Nebraska at Omaha.

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Oil Is Ammunition . . . Use It Wisely

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